PAINT and VARNISH *Production*

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VENTION
ISSUE

PROGRAMS
PAGES 84-85

EXHIBITORS
PAGES 86-89

OVEMBER
1954

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(REG U.S. PATENT OFFICE)

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(Established in 1910 as The Paint and Varnish Record)

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NEXT ISSUE

An article entitled, "Interior Wall Paints Based on Vinyl Acetate Resin Latex," is scheduled for the December issue. Properties, formulation, and uses will be discussed in detail.

A report on both paint conventions and the Paint Industries' Show will also be presented in this particular number.

FEATURES

DEPARTMENTS

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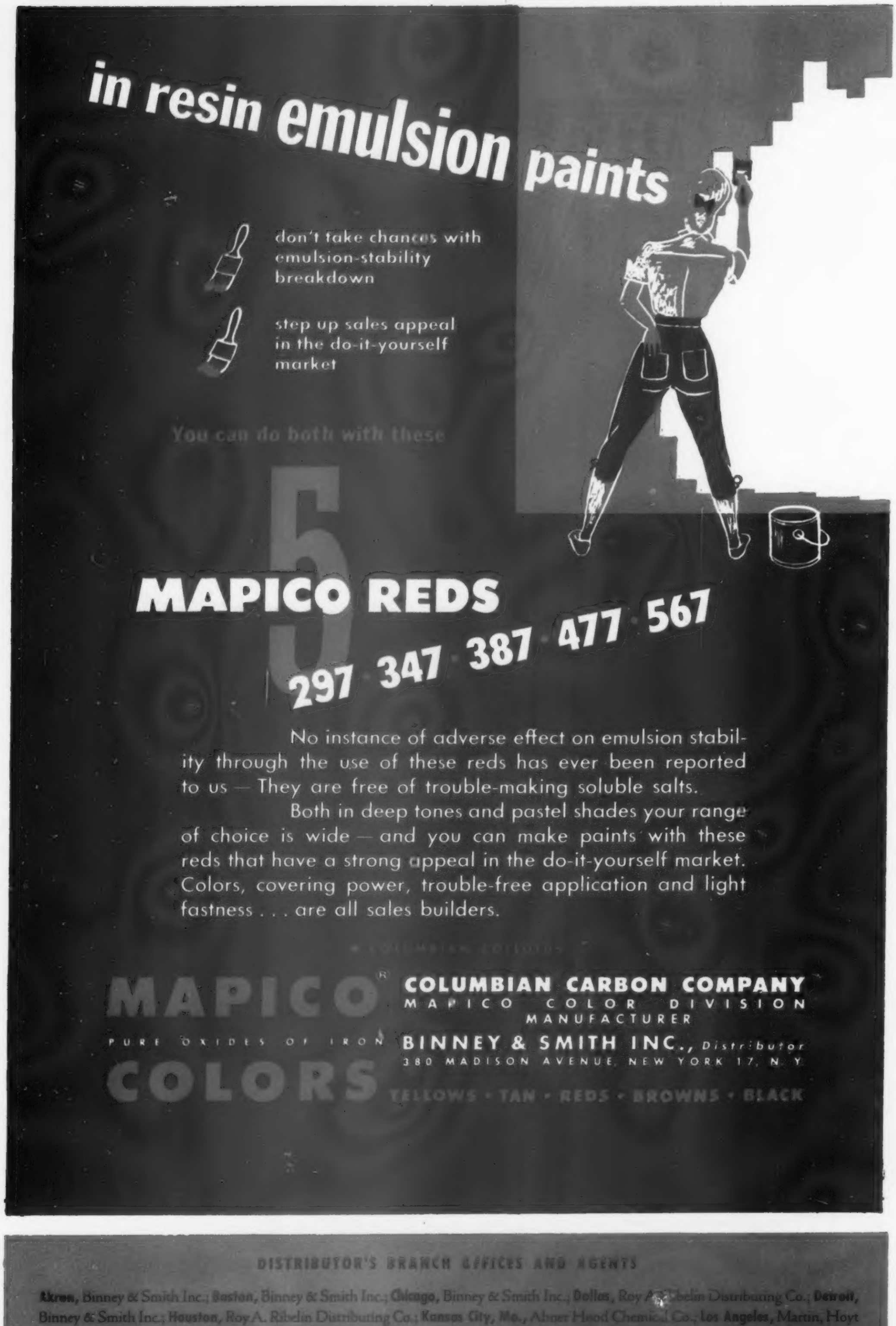
Neither our circulation nor our editorial service to you, the reader, is diluted with nondescript material. Readers who do not have a primary interest in the manufacture of paints, varnishes, lacquers and allied coatings, are not included in this circulation.

You will understand, therefore, why we regard this as a significant milestone in the progress of PAINT AND VARNISH PRODUCTION in its dedication to serving the technical and production men of this fine and fast-growing industry.

By

John Powell

Publisher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Editorial Comment

A Banner Attraction

THE WEEK of November 15th will be one of important significance to the coatings industry, particularly so, because this will be the last time that both the National Paint, Varnish and Lacquer Association and the Federation of Paint and Varnish Production Clubs will meet during the same week and in the same city.

As in the past, both organizations have arranged enlightening and comprehensive programs for their respective meetings in Chicago.

The theme of this year's Association convention is "Progress Makes Prosperity." In this connection, the Association has scheduled three renowned speakers: Leo M. Cherne, Arthur S. Flemming, and Harold C. McClellan whose respective talks will be "Toward 1955, With Hope or Fear", "The National Defense Mobilization Program", and "Blueprint for Industrial Statesmanship." In addition S. I. Hayakawa, noted author and lecturer will address the group on "Success and Failure in Communication."

Of special interest will be the four management forums scheduled dealing with Industrial Product Finishes, Trade Sales Products, Advertising and Sales Promotion, Putty, Glazing Materials and Caulking Compounds, and Roof Coatings.

The Mattiello Lecture, the Keynote Address, the Paint Industries' Show, and a panel discussion on polyvinyl acetate paints are but a few of the highlights scheduled for the 32 Annual Meeting of the Federation.

This year's Keynote Address will be presented by Dr. John T. Rettaliata, president of Illinois Institute of Technology.

The Federation's own Dr. James S. Long of the Devoe & Raynolds Company has been selected to deliver the Sixth Mattiello Lecture. The subject of Dr. Long's lecture will be "Creative Imagination as It Applies to the Decorative and Protective Coatings Industry."

These two outstanding presentations will focus attention on the major objectives of the Federation, namely education and research.

As in the past, several constituent club papers dealing with various research studies will be presented. In addition, interesting talks bearing the imprint of the U. S. Dept. of Agriculture, the Oil and Colour Chemists' Association (London), and far-off Pakistan will be featured during the three day meeting.

"Polyvinyl Acetate Emulsion Paints" will be the topic of a timely panel discussion and will undoubtedly appeal to all those engaged in developing water emulsion paints for both interior and exterior use.

Other important events scheduled are a discussion on fume control in the paint and varnish industry and an educational session.

Seventy-two exhibitors will participate in the 19th Paint Industries' Show. For the fourth successive year, a lacquer information center, depicting the latest developments in lacquer technology, formulation, and application, will be presented through the efforts of the suppliers of raw materials for lacquer and suppliers of equipment for spraying lacquer.

The Paint Industries' Show serves as a focal point where technical and production men can look for answers to their problems. There is no better opportunity available for one to review, at one time, the most recent developments in raw materials and equipment. The interchange of ideas with those producing basic materials and equipment will materially contribute to the technological growth of the coatings industry.

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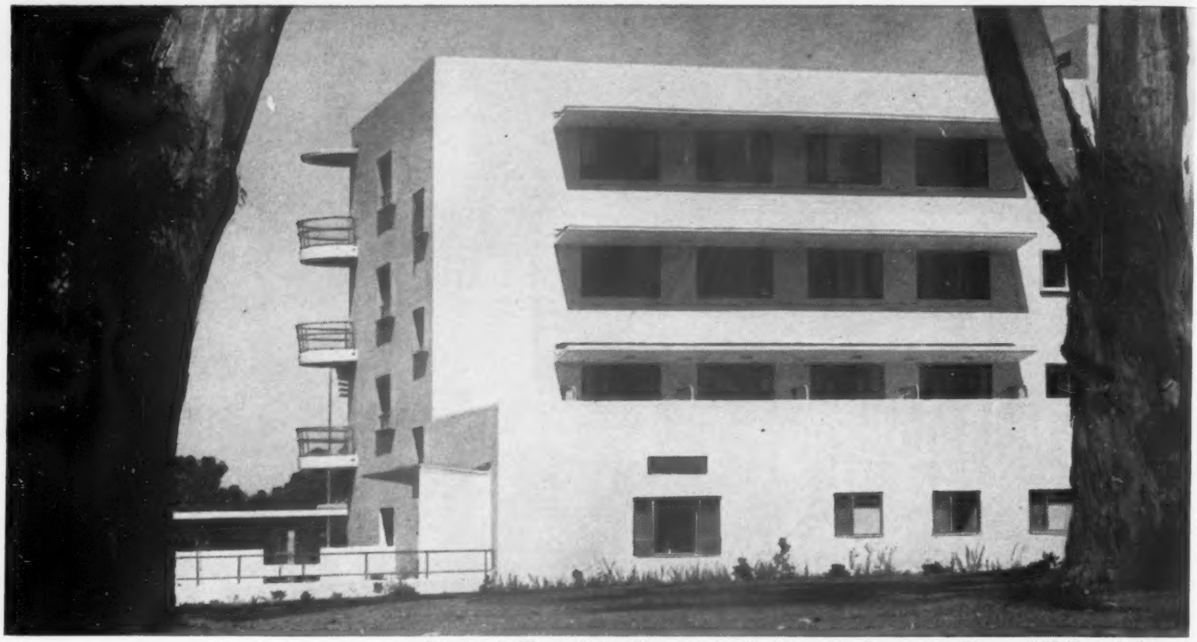

Penninsula Hospital, San Mateo, painted with exterior latex paint. Stone and Mulloy, Architects —Marraccini and Patterson, Partner Architects. Russell Hinton Company, Painting Contractor.

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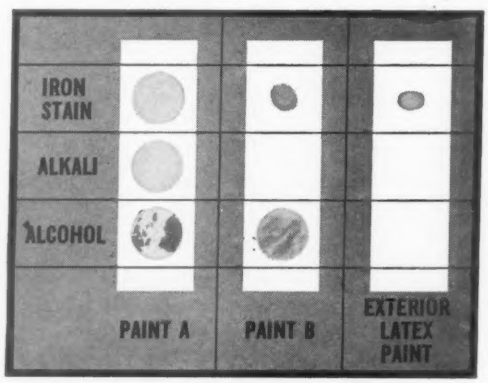

***PAINT THREE DIFFERENT PANELS* with an exterior latex paint and two other typical exterior paints. Put a few drops of alcohol, iron oxide in water and 5% sodium hydroxide (an alkali) on each. In twenty minutes, try scraping the paints where these reagents have been on them. See how much better the latex paint has stood up.**

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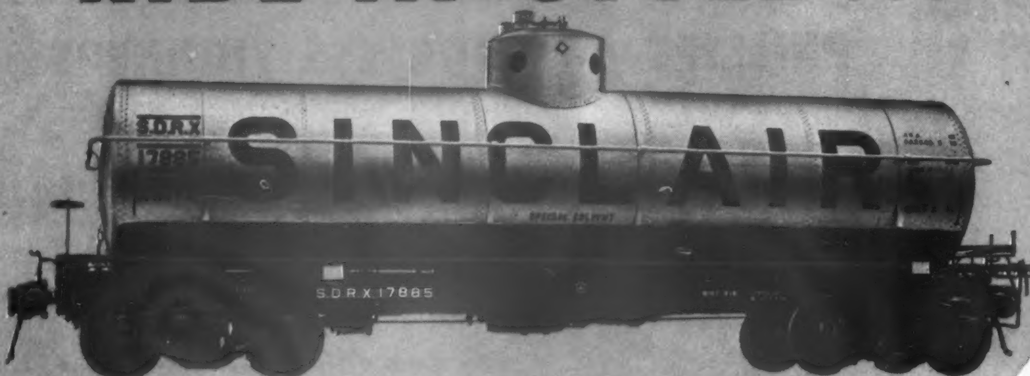

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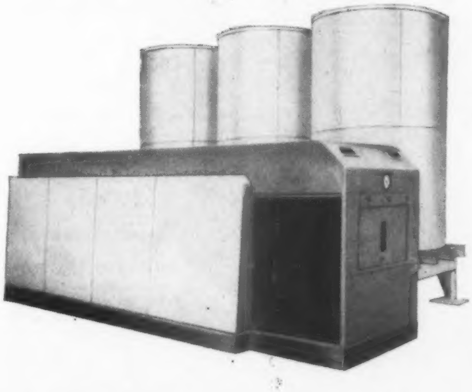

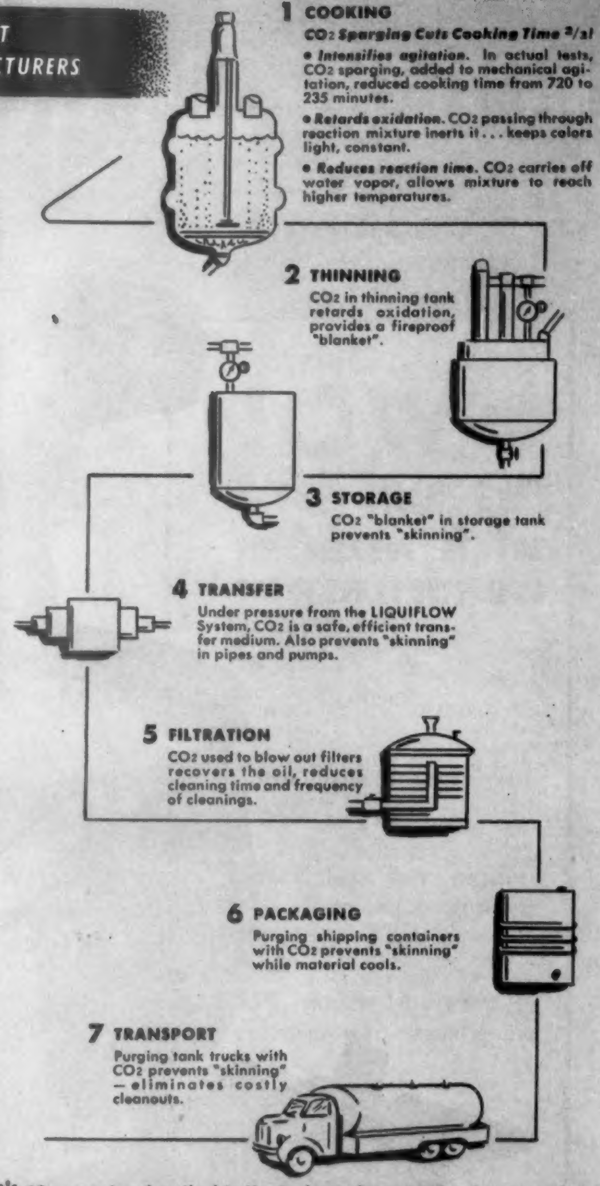

** CO_2 sparging described in No. 1 above shows results of tests conducted by MONSANTO CHEMICAL COMPANY in their Resin Materials Application Research Laboratories. Other material was gained from field and lab research carried on by the Liquid Carbonic technical staff.*

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has what it takes to make foolproof exterior paints

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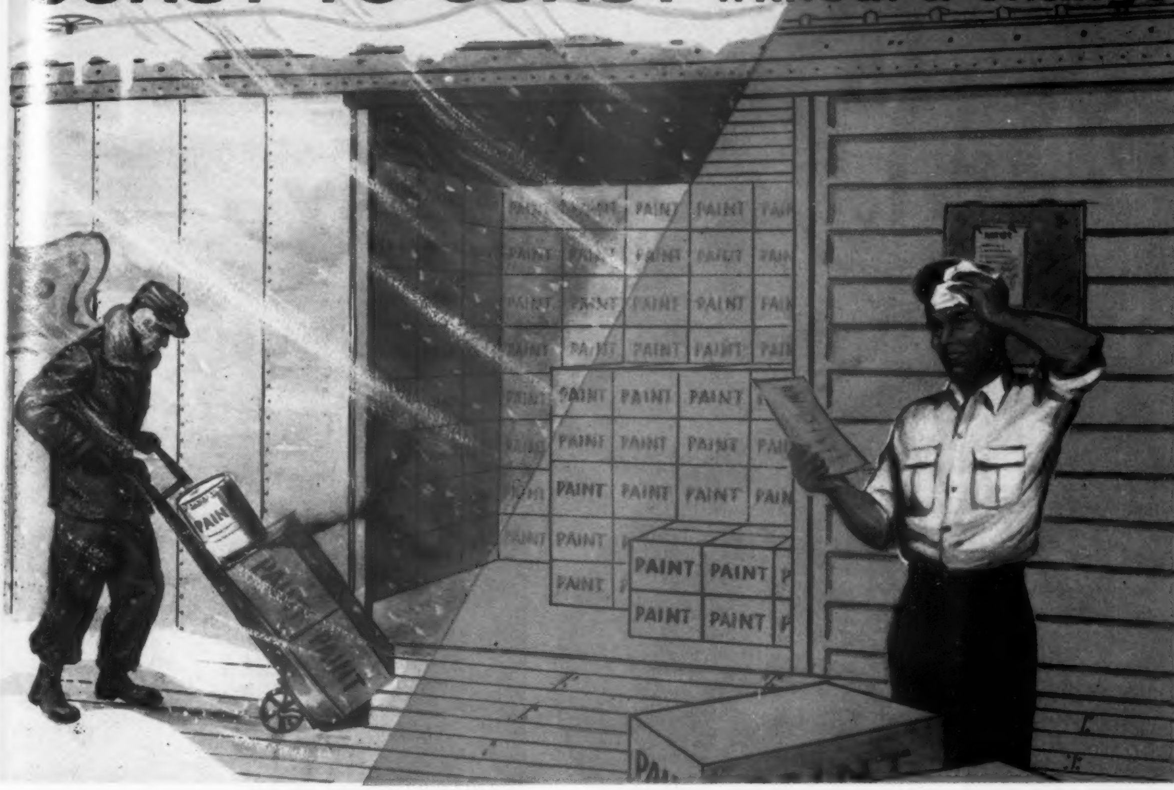

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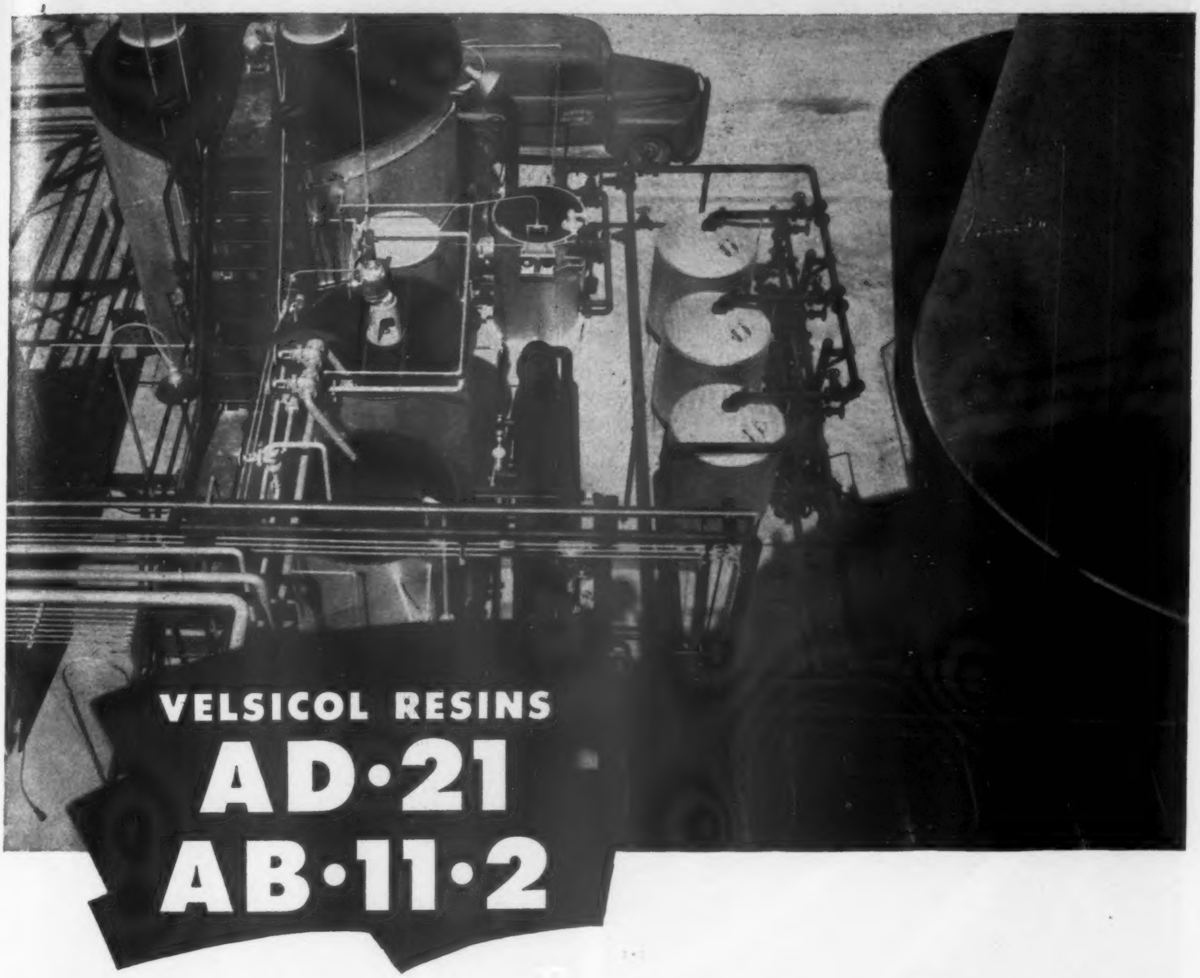

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Recent Developments In Resins For Industrial Finishes

Since the early twenties when nitrocellulose lacquers were first introduced to the finishing industry, manufacturers of industrial finishes have made great strides in developing finishes with specific properties for innumerable products.

It cannot be denied that this spectacular development was, and is still due, in a large measure, to the introduction of new coating resins and vehicles. As new resins with unique properties were made available to the coatings industry, in many instances, it meant that the manufacturer of industrial finishes could now develop products which would meet the exacting requirements demanded by his customers.

The ensuing series of articles is intended to keep the reader abreast of the advances that have taken place in the more important resins and vehicles for application in product finishes, during the last decade.

Every attempt was made to insure completeness of this summary, and if omissions have occurred they were through no failure of effort on our part.

All opinions and claims made in the following articles are strictly those of the authors' and do not necessarily represent editorial endorsement.

The Editor

ACRYLICS

Range of properties such as transparency, fast dry, chemical resistance, flexibility, toughness, outdoor durability permit formulation of a variety of finishes which can fit into a number of specialized uses; a recent development is a water-type automotive primer based on an emulsion of this resin

By
Gerould D. Allyn*

G. D. Allyn

ACRYLIC and methacrylic ester polymers are one of the more recently developed types of synthetic resins used in the protective coating industry. Basically these resins are polymerized ester derivatives of acrylic and methacrylic acids. The alcohols of most interest for the esterification are the lower molecular weight alcohols ranging from methyl to butyl alcohol.

Acrylic acid and the related methacrylic acid have been known for many years but only in recent years have the polymerized esters been used in industrial finishing. Early polymers were the inevitable "gels", "rubbery masses" and "glasses" and their composition and utility were not well understood. Later research has clarified their composition and film properties; tough, water-white, and chemically resistant. Consequently, today it is possible to take advantage, in the production of industrial finishes, of these properties which were so irksome to chemists of the "purified crystal" school.

The characteristics of these polymers depend on the chemical composition and the methods of polymerization. The acrylate polymers are essentially tough and rubbery in nature. The higher alcohols, such as butyl, when used in the esterification of the monomer yield soft films while the lower alcohols, such as methyl, give harder films.

The substitution of a methyl group for a hydrogen atom in the acrylic molecule gives a methacrylic monomer. When polymerized, the polymer is considerably harder and more rigid than the corresponding acrylic polymer. Fortunately, these and other monomers can be polymerized together to yield surface coating films with a wide range of hardness and flexibility properties.

The acrylic resins in organic solution form are perhaps best known in the industrial finishing field. Recently, however, progress has been made in the production and application of emulsion forms of these polymers. While the properties of the films produced are similar in many ways, the physical properties of the polymers are quite different and will be considered later in this paper.

General Properties

Membe s of this series of copolymers exhibit the following characteristics:

- Water-white color
- Transparency
- Resistance to discoloration at elevated temperatures
- Resistance to water, acids and alkalies
- Exceptional resistance to chemical fumes
- Film toughness
- Good electrical properties
- Flexibility, particularly in softer polymers
- Extremely low pigment reactivity

Chemically these coating polymers are related to "Plexiglas," the transparent acrylic plastic which has become a great new material of our time. As indicated above, these polymers have many of the properties associated with this particular plastic particularly water-white color, chemical resistance, outdoor durability and resistance to change on aging.

Uses in Industrial Finishes

As can be seen from the preceding description, a very large number of different copolymers can be made from the esters of acrylic and methacrylic acid. Some of these copolymers naturally are more useful than others for industrial finishing problems. The commercially available materials differ chiefly in hardness, flexibility, viscosity and solubility in various solvents. All of them impart some very interesting properties in industrial finishes. These properties are as follows:

- Fast air-drying speed (dry on evaporation of solvent)
- Water-white color retention in clears or pigmented systems
- Extremely transparent clear films
- High resistance to chemicals and chemical fumes
- Excellent gloss retention
- Good toughness and flexibility
- Practically non-reactive with pigments
- Good outdoor durability

These properties mean that the acrylic resins fit into a number of specialized end-uses. Among the more important of these are the following:

- Color retentive white enamels for stoves and electrical heaters
- Clear coatings for household hardware, silver candlesticks, chromeplate
- Fume-proof white brushing enamels for severe industrial exposures

*Gerould D. Allyn is connected with the Rohm & Haas Co., Philadelphia, Penna.

Grade	Solids	Solvent	Specific Gravity	Viscosity-Centipoises at 30° C.	Tensile Strength Lbs./Sq. In.	Percent Ultimate Elongation	Toughness[3] Inch Pounds Per Cu. In.
Acryloid A-10	30	Cellosolve acetate	1.03	710-850	——	—	——
Acryloid A-101	40	Methyl ethyl ketone	0.94	700-1500[2]	4100	3	60
Acryloid B-72[1]	40	Toluol	0.97	480-640	2900	44	1000
Acryloid B-82[1]	40	Toluol	0.97	480-640	2900	77	2000
Acryloid C-10LV	40	Toluol	0.97	40-80	——	—	——
Acryloid F-10	40	Mineral thinner and Amsco F	0.91	1500	2200	64	1200

[1]Also available at 100% solids
[2]Determined at 35% solids
[3]Values shown are the area under the tensile elongation curve

Table I. Physical characteristics of a series of acrylic type polymers.

- Water-white wood finishes
- Clear aerosol sprays
- Luminescent and fluorescent coatings
- Top coats on vinyl film
- Fabric base and top coats
- Adherent lacquers for rubber articles
- Water-white specialty adhesives
- Aerosol "snow"
- Silk screen inks

The physical characteristics of a series of acrylic type polymers are shown in Table I.

Formulating Techniques

The acrylic resins are formulated using rather conventional techniques. Since their pigment binding properties are good, a pigment:binder ratio of 40:60 in a white gives excellent gloss. Generally, coal tar hydrocarbons must be used for the solvent. The hardest grades require ketone or ester solvents. Some special grades are available which can be thinned with aliphatic solvents such as mineral spirits.

Conventional grinding equipment such as roller mills or pebble mills are usually used. Generally, quite fine grinds are desired to give maximum glosss. It is helpful to run a roller mill or pebble mill quite warm for best pigment wetting and dispersion.

Acrylic finishes may be applied in a number of different ways depending on the object to be coated. Application may be made by spray gun, aerosol container, dipping, brushing or machine coating. It should be remembered that the acrylic resins have high molecular weights and are inherently very viscous. Since they dry by solvent evaporation, films must be applied in a comparatively wet condition in order that adequate flow may take place. Due to this high degree of polymerization, precautions must be taken when these finishes are sprayed to avoid feathering or pin-holing.

Several typical formulations illustrating various uses for the acrylic resins are given in this section.

Acrylic Resin Heat Resistant White Enamel

	Parts by Weight
Roller Mill Grind	
Titanium dioxide	15.2
Acryloid A-10 (30%solids)	7.6
Toluol	2.3
Mix With	
Acryloid A-10 (30% solids)	68.1
Monoplex DBS	0.8
Diethyl phthalate	0.8
Toluol	5.2
	100.0

Total solids 37.9%
Pigment 40.0%
Binder 60.0%
Viscosity (No. 4 Ford Cup) 90 seconds (app.)

Acrylic resins have been widely used as top coats on vinyl film and coated fabrics. They reduce plasticizer volatility and the tacky or oil feel characteristic of many vinyl products. Acryloid A-101 may be used alone or with 50% Vinylite VYHH for this purpose. The system should be reduced with solvent combination, strong enough to insure adequate solubility for the vinyl resins.

One of the important uses of the acrylic resins has been in luminescent coatings where a water-white, nonreactive vehicle is required.

Phosphorescent Coating

	Pounds
Pigment-50.5%	
Phosphorescent 2479 or 2480[1]	510½
Zinc palmitate	56
Vehicle-49.5%	
Acryloid B-82LV	358
Xylol	197½
Total	1124 lbs. or approximately 100 gallons of paint

The zinc palmitate is mixed into a portion of the Acryloid B-82LV (30:70 by weight). The phosphorescent pigment is then mixed with the zinc palmitate—Acryloid B-82LV paste, the balance of the vehicle added, and the batch thinned with xylol. Paints of this type should be applied over a solid covering undercoat. Two coats are suggested for most work where the coating is to be exposed to heavy rainfall or very high humidity. A clear coat of the vehicle reduced to 15-20% solids should be applied over the luminescent paint for longest life.

1—N.J. Zinc Co.

Clear coatings can be made by reducing the appropriate acrylic resin solution with solvents to application viscosity. Clear coatings of this type are widely used for spray application to chrome-plate, hardware, lamp shades and the like.

Color Retentive White Enamel

	Lbs.	Gals.
Roller Mill Grind		
Titanium dioxide	142.5	4.4
Acryloid B-82 (40% solids)	133.5	16.5
Xylol	17.8	2.5
Mix With		
Acryloid B-82 (40% solids)	401.0	49.5
Xylol	196.2	27.1
Physical Constants	891.0	100.0
Weight per gallon	8.9 lbs.	
Total solids	40.0%	
Pigment 40%		
Binder 60%		
Set time (minutes)	3	
Tack free time (Zapon tester-hours)		
500 gram weight	1½	
1000 gram weight	3	
Overnight hardness (Sward)	26	
Pencil hardness		
Air dry-48 hours	B	
Baked 30 min. at 300°F.	3H	
Baked 10 min. at 350°F.	3H	
Gloss (Photovolt tester)		
Air dry	84.6	
Baked 30 min. at 300°F.	84.5	
Baked 10 min. at 350°F.	84.8	

Water-White Wood Finishing Lacquer

	Parts by Weight (Solids)
Acryloid B-72	50
½" RS Nitrocellulose	35
Paraplex G-50	15
	100

This formulation shows excellent color and color retention even after prolonged exposure to ultra-violet light. Print resistance and hardness are satisfactory. At 25% solids the formulation has a viscosity of approximately V and it can be sprayed at 14% solids.

(*Turn to page 135*)

ALKYDS

Used at an ever increasing rate, alkyd baking enamels, formulated with specific properties to meet end-use requirements, find their way on countless metal products

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DURING the past twenty-five years production and usage of alkyd resins as components of protective coatings of all types have increased at an amazing rate. From one million pounds in 1927, usage of these products has expanded to over 400 million pounds in 1953, thus overshadowing all other film forming materials used in paints and varnishes. This tremendous growth is especially evident in the field of industrial baking enamels for metal, for these are the products which form the handsome, fast curing, durable finishes for the ever increasing numbers of modern automobiles, refrigerators, home washers and ironers, kitchen appliances, metal venetian blinds, and other familiar articles found in every home, farm or factory.

New Chemicals Spur Progress

The growth of alkyd resins occurred as a direct result of the advent of cheap, plentiful phthalic anhydride after World War I and has in turn spurred the development in recent years of a great variety of new raw materials over and above the conventional ingredients. Vegetable oil or fatty acid, glycerol and

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Polyfunctional Acids

- Phthalic Anhydride
- Phthalic Acid
- Tetrahydrophthalic Acid
- Hexahydrophthalic Acid
- Maleic Anhydride
- Maleic Acid
- Fumaric Acid
- Adipic Acid
- Sebacic Acid
- Succinic Anhydride
- Succinic Acid
- Isophthalic Acid
- Dimethyl Isophthalate
- Terephthalic Acid
- Dimethyl Terephthalate
- Maleic Adducts

Polyhydric Alcohols

- Glycerol
- Pentaerythritol
- Dipentaerythritol
- Polypentaerythritol
- Trimethylolethane
- Sorbitol
- Mannitol
- Ethylene Glycol
- Diethylene Glycol
- Propylene Glycol

Monofunctional Acids and Vegetable Oils

- Soybean Fatty Acids
- Soybean Oil
- Linseed Fatty Acids
- Linseed Oil
- Safflower Fatty Acids
- Safflower Oil
- Ricinoleic Acid
- Castor Oil
- Dehydrated Castor Oil
- Tung Fatty Acids
- Tung Oil
- Coconut Fatty Acids
- Lauric Acid
- Coconut Oil
- Cottonseed Fatty Acids
- Cottonseed Oil
- Oiticica Fatty Acids
- Oiticica Oil
- Rosin
- Tall Oil Acids
- Benzoic Acid
- para-tertiary-Butylbenzoic Acid
- Toluic Acid

Monofunctional Alcohols

- Tetrahydroabietyl Alcohol ("Abitol")
- Fatty Alcohols, saturated and unsaturated

Olefinic Modifiers

- Styrene
- Alpha-methylstyrene
- Divinylbenzene
- Vinyltoluene

Figure 1. List of alkyd resin ingredients and modifying agents.

A-Series: Resin Properties

	Experimental Resin PX-174	Glycerol Alkyd Standard Control
Solids, %	60	50
Solvent	Xylol	Xylol
Acid Number, solids	10.0	6-14
Viscosity	V-	T-W
Color	6+	3-7
Oil Length	41	41
Oil Type	Soya	Soya
Phthalic Anhydride	38	42
Other Modifiers	None	None

A-Series: Enamel Formulations

Automotive enamels were formulated as follows:

	Experimental Resin PX-174		Glycerol Alkyd Standard Control	
	Pounds	Gallons	Pounds	Gallons
Titanium Dioxide, Rutile	155.40	4.67	155.40	4.67
Carbon Black	0.75	0.05	0.75	0.05
Alkyd Resin	430.40	51.68	514.00	63.38
"PLASKON"3382 Melamine Resin	84.10	9.60	84.10	9.60
Xylol	243.35	34.00	159.75	22.30
Totals	914.00	100.00	914.00	100.00

Typical short-oil soya alkyd used in automotive topcoat enamels.

B-Series: Resin Properties

	Experimental Resin PR-4	Glycerol Alkyd Standard Control
Solids, %	60	60
Solvent	Xylol	Xylol
Acid Number, solids	5.5	6.6
Viscosity	Z-Z_1	Z_2-Z_3
Color	1	4
Oil Length	34	34
Oil Type	Coconut	Coconut
Phthalic Anhydride	45	45
Other Modifiers	None	None

B-Series: Enamel Formulations

White baking enamels were formulated as follows:

	Pounds	Gallons
Titanium Dioxide, Rutile	339.10	9.70
Zinc Oxide	9.30	0.20
Alkyd Resin	406.50	47.20
"PLASKON" 3382 Melamine Resin	190.00	22.69
Xylol	142.83	19.95
Triethylamine	1.57	0.26
Totals	1089.30	100.00

Short-oil coconut alkyd used in high quality non-yellowing baking enamels.

phthalic anhydride generally constituted the "staples" of alkyd resin manufacture prior to World War II. Today, although phthalic anhydride remains as the main building block of alkyd resins and huge quantities of glycerol and ordinary oils and fatty acids are still consumed, the resin technologist has at his disposal no less than sixteen polyfunctional acids, ten polyhydric alcohols, and twenty-nine varieties of monofunctional acids, vegetable oils, monofunctional alcohols, and olefinic modifiers.

When confronted with a list of alkyd resin ingredients and modifying agents as indicated in Figure I, one can readily see that the jobs of the alkyd resin chemist and the industrial enamel formulator are well on their way to becoming increasingly complicated. This should not be regarded as an unnatural state of affairs, however, because each specific type of baking enamel requires a vehicle which, in addition to yielding a reasonable degree of general excellence to the enamel, must possess certain special properties dictated by the particular end use involved. To cite a few examples of this, it is obvious that finishes for laundry equipment must have extra resistance to corrosion by soaps and detergents and extra resistance to high humidities. Automotive finishes must have very superior exterior durability, color and gloss retention. Refrigerator finishes must retain their whiteness and resist grease and food staining.

Furthermore, the industrial finishing industry is constantly seeking a greater degree of perfection in its products. Because this industry is dynamic rather than static in character, baking enamel manufacturers are always "in the market" for alkyd resins which will help them achieve faster curing speeds, lower temperatures for baking, improved color, color retention, gloss, gloss retention, and better adhesion, flexibility, corrosion resistance, and durability than can be obtained with resins in current use. Cost also is an important and prime factor in this very active and highly competitive industry. Perhaps the simplest way to state the goals of alkyd resin improvers is: "best possible performance at least possible cost."

Exemplifying some of the opportunities for progress opened up by the availability of new raw materials, we will describe some experimental work carried out at the *Barrett Glendale-Plaskon Laboratory, Toledo, Ohio,* wherein a new polyhydric alcohol was substituted for glycerol on an essentially equivalent basis in two well known types of alkyd resins:

A. A typical short-oil soya alkyd used in automotive topcoat enamels. (A-Series)
B. A short-oil coconut alkyd used in highest quality non-yellowing white baking enamels. (B-Series)

In each case, alkyds were prepared in accordance with standard processing techniques.

Part of the objective in A-Series was to create an alkyd which at higher solids content than the standard control would fall in essentially the same viscosity range yet be able to demonstrate equivalent or superior rate of cure.

These enamels were sprayed over primed bonderized steel panels to a dry film thickness of 1 mil.

Tests performed and results obtained are shown in Figure 2.

Although additional testing will be required to prove the durability and weathering qualities of experimental resin PX-174, the available data do indicate that a resin has been developed which at lower intrinsic viscosity than the standard control shows improved curing rate at the relatively low baking temperature of 240° F., equivalent physical properties and equivalent resistance to boiling water and gasoline.

	Experimental Resin PX-174	Glycerol Alkyd Standard Control
Enamel Viscosities		
#4 Ford Cup, seconds @ 25 C	19	22
Film Properties		
Panels baked 40 min @ 240 F		
Sward Hardness	34	26
Gloss - 60°	91	92
Gloss - 20°	84	83
Immersion in boiling water - 2 hrs.	Fine blisters over 1/4 panel	Fine blisters over 1/2 panel
Conical Mandrel bend	No cracks or striations	No cracks or striations
Impact - 40 inch pounds	No breaks on indentation	1/4 inch circular break on indentation
	1/2 inch break on extrusion	1/2 inch break on extrusion
Immersion in gasoline - 48 hrs.	Same as control	Film slightly softened - recovered
Panels overbaked 2 hrs @ 300 F		
Sward Hardness	52	46
Gloss - 60°	82	80
Gloss - 20°	56	49
Color Retention	Same as control	Slight color change

Figure 2. Comparison of test performance of Px-174 with standard alkyd.

These enamels were cast on plate glass panels with a doctor blade yielding wet film thickness of 3 mils. For evaluation of detergent resistance, the enamels were applied by spray to unprimed bonderized steel panels, yielding dry film thickness of 1.5 mils.

Test performed and results obtained are shown in Figure 3.

In interpreting the evaluation data for experimental resin PR-4, again it is evident that additional testing will be required to prove this product for commercial use; the available information on its performance does, however, indicate that harder films than those yielded by the standard have been obtained. Superior gloss and quite superior detergent resistance as compared with the standard have been attained.

To aid the resin chemist in gaining familiarity with the properties and uses of new raw materials, the suppliers of these materials frequently offer excellent technical services and assistance and publish very well prepared and informative technical bulletins, a few of which are listed below:

1. Technical Service Bulletin S-88, "Hercules Pentaerythritol" Hercules Powder Company, Wilmington, Delaware.
2. Technical Bulletin SC:51-25, "p-tertiary-Butylbenzoic Acid in Surface Coating Resins" Shell Chemical Corporation, New York, New York.
3. "Safflower Oil, Properties and Applications in Protective Coatings" Pacific Vegetable Oil Corporation, San Francisco, California.
4. Technical Bulletin No. 53, "Pelargonic Acid in Baking Enamels" Emery Industries, Inc., Cincinnati, Ohio.
5. Development Bulletin No. 30, "Technical Dimethyl Isophthalate" Hercules Powder Company, Wilmington, Delaware.
6. Bulletin No. 10, "Isophthalic Acid" Oronite Chemical Company, San Francisco, California.
7. "Acintol Tall Oil Products" Arizona Chemical Company, New York, New York.
8. Technical Bulletin 1-1, "Tetrahydro Phthalic Anhydride" National Aniline Division, Allied Chemical & Dye Corporation, New York, New York.
9. Technical Bulletin 1-2, "Hexahydro Phthalic Anhydride" National Aniline Division, Allied Chemical & Dye Corporation, New York, New York.
10. Technical Bulletin 1-5, "Nadic' Anhydride" National Aniline Division, Allied Chemical & Dye Corporation, New York, New York.

Figure 3. Comparison of test performance of PR-4 with standard alkyd.

	Experimental Resin PR-4	Glycerol Alkyd Standard Control
Enamel Viscosities		
#4 Ford Cup, seconds @ 25 C	32	43
Film Properties		
Panels baked 10 min @ 300 F		
Sward Hardness	34	26
Gloss - 60°	96	95
Gloss - 20°	93	90
Panels baked 20 min @ 300 F		
Sward Hardness	48	46
Gloss - 60°	95	90
Gloss - 20°	85	72
Panels baked 30 min @ 300 F		
Sward Hardness	48	46
Gloss - 60°	95	85
Gloss - 20°	83	63
Detergent Resistance* - Immersion in 1.5% "Tide" solution @ 165 F		
Panels baked 10 min @ 300 F		
24 hours immersion	9F	2D
48 hours immersion	4M	(adhesion lost)
Panels baked 20 min @ 300 F		
24 hours immersion	9F	4M
48 hours immersion	4F	2D

* Ratings reported in accordance with ASTM procedure D-714-54T, "Evaluating Degree of Blistering of Paints."

. Technical Booklets, "Phthalic Anhydride" and "Liquid Phthalic Anhydride" Barrett Division, Allied Chemical & Dye Corporation, New York, 6, New York.
. "Sorbitol in Protective and Decorative Finishes" Atlas Powder Company, Wilmington, Delaware.
. "Alkyd Resins" Monsanto Chemical Company, St. Louis 4, Missouri.
. "Vinyltoluene for use in Paints and Varnishes" Dow Chemical Company, Midland, Michigan.
. "Alpha-Methylstyrene" Dow Chemical Company, Midland, Michigan.

Engineering Spurs Progress

Modern alkyd resins have reached their present state of development not only because of chemical developments which have placed new ingredients in the hands of resin chemists, but because of an awareness on the part of the industry's chemical engineers that processing refinements, properly designed equipment and quality control are key factors necessary to efficient and properly controlled production of uniform batches of the best alkyd resins the chemists are able to devise.

Early alkyd production was carried out in the equipment previously used for varnish production—open-head, direct-fired vessels of limited capacity in most cases. Control of temperature was inadequate, colors were dark, acid numbers were high, product variations were common, batches were restricted to generally small kettle sizes, and losses were extremely high. In summary, products produced at that time would be wholly inadequate for the exacting needs of the industrial finishing industry today.

It might be of interest to review the factors which led to the elimination of the above problems. The necessity of adequate provision for the exclusion of air and protection of the resin from foreign matter and discoloring metals led to the development of the totally enclosed, stainless-steel process vessels of the modern resin plant. Solution of the temperature control problem has been accomplished by the development of modern instrumentation, combined with the use of specialized heating systems, heat-transfer media, and kettle design for maximum heat transfer.

The utilization of an inert-gas medium or a boiling solvent to aid in water removal from the esterification mass, plus the modern methods for end-point control, such as solvent quenching, either by addition to the reaction vessel or discharge of reaction mass into a thinning tank containing solvent, have permitted production of low-acid-number, uniform-quality products. Kettle losses have been materially reduced by enclosure of the vessels, the addition of reflux condensers and fume-scrubbing systems, and the adoption of solvent-processing techniques.

The Modern Alkyd Resin Plant

Although most resin plants vary with respect to detail of design, all contain the same basic components, which consist of:

1. Tankage for bulk storage of liquid chemicals, such as oils, fatty acids, glycerol, glycols, sorbitol, liquid phthalic anhydride, liquid rosin, etc.

2. Warehousing facilities and material-handling equipment for solid raw materials, such as flake phthalic anhydride, maleic anhydride, pentaerythritol, etc.

3. Weigh hoppers for exact batching of liquid and dry chemicals.

4. Alcoholysis and/or esterification kettles equipped with reflux condensers, agitators, fume scrubbers, solvent decanters, gas spargers, temperature recorder controllers, etc.

5. A temperature-control system using gas, fuel oil, or electricity for direct heating, or indirect transfer via "Dowtherm," "Arochlor," or heat-transfer oil.

6. Jacketed thinning tanks equipped with reflux condensers and agitators.

7. Filtration facilities.

8. Bulk-product storage.

9. Packing facilities for drums, tankwagons, and tankcars.

10. Warehousing area for finished products.

11. Quality-control laboratory.

Two basic processes are used for resin preparation, depending on whether the resin is to be made from an oil or a fatty acid. In the former case, alcoholysis reactions with glycerol, pentaerythritol, or other polyols, are necessary prior to further reaction. After formation of the mixed fatty-acid-modified polyol, the acid components are added and esterification proceeds. When using fatty acids, direct esterification is possible in a one-step process wherein polyacids, polyols and fatty acids are charged in toto and reacted.

After esterification to a predetermined end point, the resin reaction is stopped by quick chilling, primarily by a sensible heat interchange with the thinning solvent. The batch is then adjusted for viscosity and solids, filtered, and transferred, depending on final disposition, to bulk-shipping facilities, bulk storage, or drums.

Two basic processes are in use for the esterification reaction: (a) fusion and (b) solvent.

Fusion Process. In the Fusion process, an inert carrier is used to remove the water of esterification. This is accomplished by bubbling the gas through the reaction mass at controlled rates. CO_2 or N_2 can be purchased as a source of gas in bulk with storage and generating facilities provided by the supplier. Inert gas generators are also available which produce oxygen-free atmospheres by partial combustion of liquid or gaseous fuels. Another source of supply of N_2 for the resin producer is the small package air-distillation units now commercially available.

Solvent Process. In the solvent process, a boiling solvent is used to aid in the water removal. The solvent is condensed, water is decanted, and the solvent refluxed back to the kettle. An aromatic solvent (5-10% of the batch charge) with a suitable boiling point for the cooking temperatures desired is generally used in preference to aliphatic solvents which have a poor tolerance for phthalic anhydride. Residual solvent may be left in the batch or removed by vacuum, depending on the final resin desired.

Comparison of the two processes gives the solvent method the advantages of higher yields, faster cooking rates, and low inert-gas costs, with the disadvantages of greater costs for heat input for solvent vaporization, cooling water for solvent-condensation utilities, and complete removal of residual solvent and disposal of by-product solvent. Most modern plants have facilities for both types of processing.

Trends in Process Equipment

Material-handling programs have been initiated by the engineer in an attempt to convert from solid to liquid chemicals wherever possible. Achievements along these lines have been made in the development of properly designed systems for handling and storage in the liquid state at elevated temperatures of phthalic anhydride, rosin, and fatty acids, while still preserving the high color standards required by the paint industry.

Larger process kettles are being built, with units as large as 6,000 gallons reported in operation. "Dowtherm" systems, with as many as six or eight units operating from one vaporizer with precise temperature control at different operating temperatures, are not uncommon. Totally enclosed pressure filters with labor-saving devices are supplanting the unsightly and cumbersome plate-and-frame types. Improved pumps with specially designed shafts

(Turn to page 113)

AMINO RESINS

General application of these resins is in the formulation of baking-type finishes of varying properties for metal products

By
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THESE resins are identified, variously as "amino," "amine," "nitrogen-containing" or just plain "nitrogen" resins. Actually, their "functionality" (i.e. their ability to yield polymeric bodies) comes from two or more amine or amide groupings on a single nucleus. This compound, from which a "polymethylol body" is obtained by reaction with an aldehyde (e.g. formaldehyde), yields the "di-or poly-functional" material from which the final resin is formed.

The fundamental differences of this type of resin in comparison with o her polymeric coating vehicles may be illustrated by the following:

1. Oleoresinous varnishes such as ester-gum tun r oil compositions may be thought of as highly polymerized vegetable oil (the dispersed or gel phase) dissolved or solvated by relatively unpolymerized resin (the dispersant or sol phase), this combination having been in turn solvated by a liquid, volatile third component to the final form.
2. An alkyd resin may be thought of as essentially the reverse, in that here the resin phase is the dispersed or gel phase with the oil forming the dispersant or sol phase. Again a liquid volatile third component may be required to yield the final vehicle.
3. Cellulose esters may be thought of as high polymers (e.g. raw cellulose), originally, which have been made soluble by nitrating or acetylating some of the hydroxyl groups of the natural polymer.

   This yields a very high molecular weight material, again requiring a liquid, volatile component to reduce it to a working viscosity in its final form.
4. An amino resin, in its final form, is more of a solvated polymeric "ether" body, whereas, the preceding vehicles are solvated polymeric "ester" bodies. It contains polymeric methylene-bridged nuclei with terminal and side chain "ether" groupings resulting from interaction of the primary "condensate" or polymethylol compound with monohydric alcohols. This latter phase is the sol or dispersant, whereas, the unetherified portion might be considered the dispersed or gel phase. Again, a liquid, volatile third component completes the vehicle.

Chemical Considerations

Figure 1 illustrates what could be termed a fundamental polymer unit for an "amino" resin wherein the monohydric alcohol used is butanol and the polycondensate is urea-formaldehyde. The alkoxy group (in this particular figure, OC_4H_9) controls, to a considerable extent, many of the final resins properties. For example, if it were methoxy (OCH_3) instead of butoxy (OC_4H_9), the resulting resin could be expected to have vastly different properties. Expected properties in such cases would be poor organic solubility (e.g. insufficient hydrophobicity) and very poor compatibility with other film-forming vehicles (i.e. alkyd resin). However, it could be expected to be extremely fast-curing under heat. If the ether group were derived from n-propyl, isobutyl or n-butyl alcohols, more nearly optimum properties become apparent. Solvency in organic media, tolerance for hydrocarbon solvents, alkyd compatibility and well-modulated cure are now found. The rapid progress of poly condensation leads to difficulty in using monohydric alcohols of appreciably longer chain lengths as primary "etherifiers." Some of these longer-chain alcohols can be introduced through trans-etherification as will be mentioned later.

Other "amino" or nitrogen bodies which are used in the manufacture of these resins are shown in figure 2.

The triazine ring (three C = N or azine groups in ring form) if it has three amino groupings, one on each of the ring carbons, is termed "melamine." The other triazines shown contain only two amino groupings and one alkyl or aryl grouping on one of the ring carbons and might be termed "diamino triazines."

These latter triazines might also be thought of as substituted guanamines. Their "functionality" would obviously be only two-thirds that of the triamino-triazine.

Under conditions of reaction, resonance of both types of the illustrated triazines can occur—placing the double bonds outside the ring. It would also be possible for at least one set of

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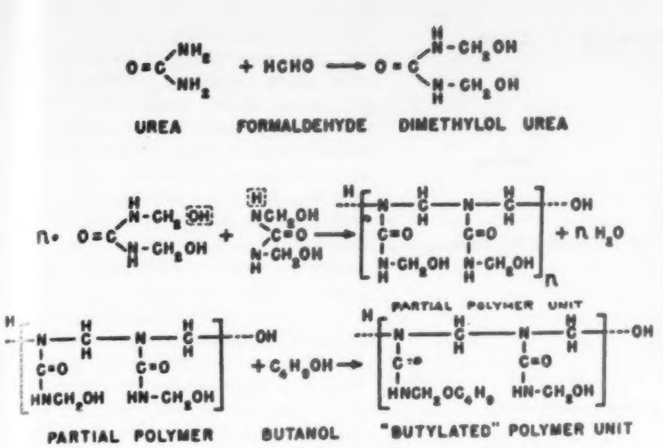


Figure 1. Fundamental polymer unit for an amino resin.

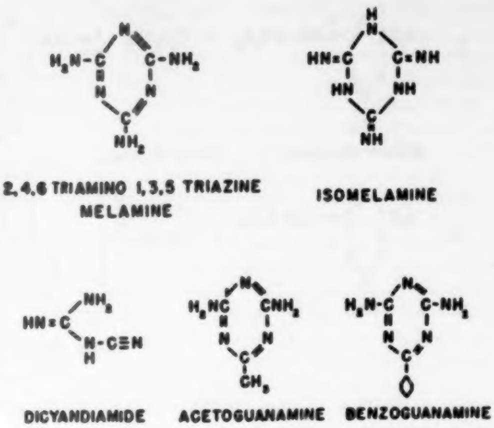


Figure 2. Nitrogen bodies used in manufacture of amino resins.

double-bonds to remain in the ring under certain other conditions.

Curing Mechanisms

Although a positive analysis of curing mechanisms in this treatise is impossible under present knowledge limitations, some concepts can be given.

Cure of the melamine resins, by themselves, is actually very sluggish but response to very small amounts of acid is excellent in normal baking ranges. (200-400° F.) (The acidity furnished by an alkyd in an alkyd-amino combination vehicle is sufficient.) Urea resins are generally not as sluggish in cure by themselves, since they normally finish up with very slight acidity under the conditions of manufacture.

Figures 3 and 4 illustrate, in exceedingly simple form, some of the products which might be present during the cure of a melamine resin by itself. The release of alcohol of etherification is necessary to attain cure. With other polyfunctional "amino" bodies, the curing mechanism is quite similar and is very likely always to involve the splitting out of the etherifying alcohol. Heat of varying intensity and of varying lengths of time (depending on the intensity) is the most satisfactory means of accomplishing this end, although acid catalysts plus heat of lower intensity are sometimes successful. Curing of an amino resin in the presence of an alkyd resin provides an additional mechanism via a transetherification premise in which the higher boiling alcohol replaces the lower-boiling one comprising the original "ether." Alkyd resins high in hydroxyl content are very susceptible to this possible reaction with amino resins and this may be one of the reasons why short-oil alkyds carrying a fair excess hydroxyl over the theoretical amount are more compatible in the baked film, yielding high gloss, versus the same type of alkyd without such excess, which frequently yields a cured film lacking in both gloss and toughness. The mild acidity of the alkyd in either case is sufficient to allow the curing reactions previously discussed to proceed. (See figure 5)

Type Differences

Since it is unlikely that it will be possible to attain all of the desired properties in a single amino resin, there are several distinct types available. Table I describes the existing types of melamine resins and Table II shows those based on urea. Another form of classification might show these types as "short", "medium", or "long". However, such a designation might be confusing since these terms have, in

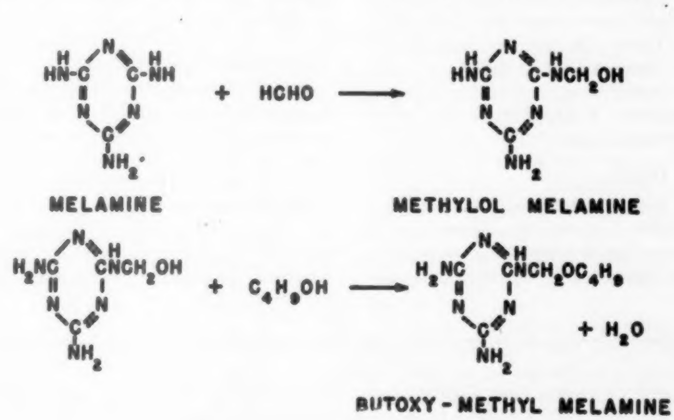
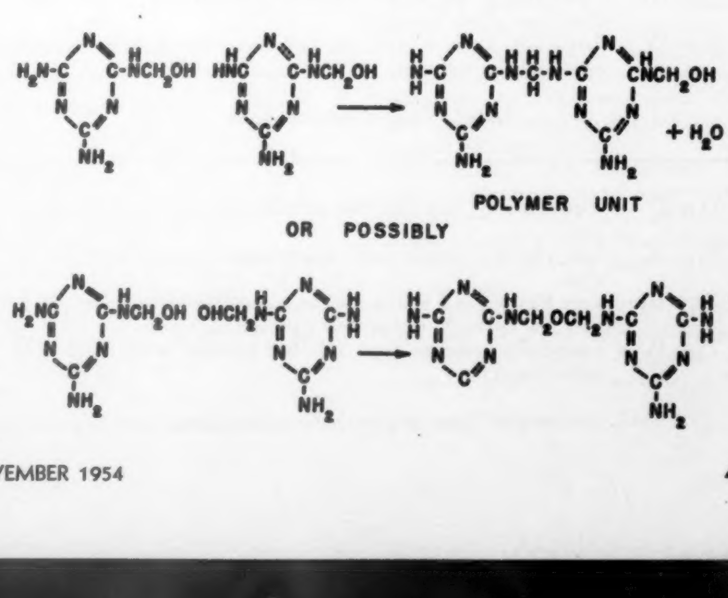


Figure 3 (above) and Figure 4 (below) illustrate some of the products present during cure of melamine resin.



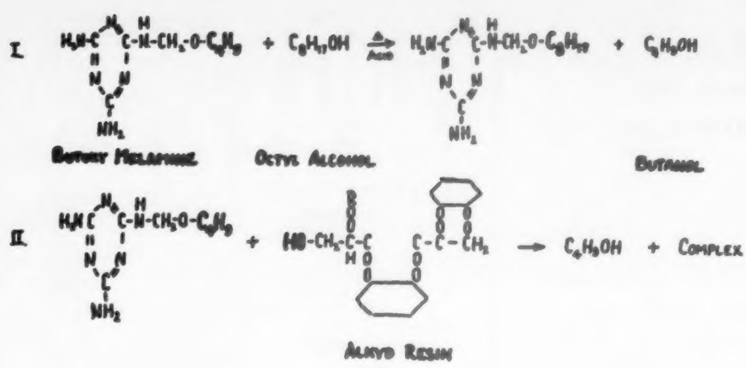


Figure 5. Curing reaction of amino resin in presence of an alkyd resin.

vehicle parlance been so long associated with oil content. To designate amino resin as short, medium, or long would very probably have to take into account the solution viscosity, speed of cure, mineral spirits tolerance, degree of "alkylation" or ether content and possible other factors. In the classification used, Type I in Tables I & II could be considered "short", Type II as "long" and Types III & IV as "medium." Resins sometimes identified as "internally plasticized" could be considered to be Type III, IV, or "medium." Rather sharp points of difference exist in the performance of melamine and urea resins. Table III shows these general comparisons.

Applications

Generally speaking, and with regard to possible exceptions, amino resins have applications wherever a coating can be baked, and equally generally speaking, regardless of the substrata on which such finishes are to be applied. However, their actual general applications are confined to metal substrata, and in cases where the cure can be catalyzed (applies to the urea types primarily) in wood finishes to be force-dried at 100-150° F. Other more or less highly specialized applications would include certain textile and paper coatings. It is proposed to confine the ensuing discussion largely to finishes for articles fabricated of metal.

Theoretical Possibilities

Butylated melamine—and urea—formaldehyde resins should be considered as intermediate reactive resins rather than film-formers in themselves. Both of these amino types, if attempts are made to use them alone are relatively poor film-forming materials in that they are somewhat brittle and still possess reactive groupings, rendering them subject to attack in the later stages of their film life. Their most successful use, then, depends upon blending with other resins capable of interaction with the amino resin, application of the blend on a surface and subsequent evaporation of the solvent, followed by "curing" at relatively high temperatures to form a hard, tough, chemically-resistant film. The film formed actually is probably a new resin, possessing properties distinctly superior in many respects to those of either component resin. The modifying resin is frequently a flexible one in itself, but it need not necessarily be so, since two "brittle" resins (referring, of course, to the original physical state of each) may intereact to form an exceedingly tough, flexible film. An example might be cited in the case of the combination of butylated melamine-formaldehyde resin with certain epoxy-type resins. This latter is the reaction product of epichlorhydrin and a polynuclear phenol (e.g. bisphenol) in polymeric form. A resin suitable for modifying amino resins as described above must be soluble in a mutual solvent system, must be compatible (as judged by a perfectly haze-free film when the combination is baked out on glass,) and must have sufficient "functionality" to provide for interaction with the amino resin. Under these conditions the reactive groups or "points of attack" of both resin components are combined and a new resin is formed, right in the film, which has superior properties.

There are a number of modifying resins which meet the above requirements, but those most generally effective are the oil-modified alkyd resins, polyvinyl butyrals, partially hydrolyzed polyvinyl chloride-acetate interpolymers, alcohol-soluble phenolic resins and the epoxy resins mentioned above.

It is to be noted that all of these modifying resins contain available hydroxyl groups, thus providing the necessary reactive points essential to film compatibility. Of the modifiers mentioned, the alkyds are by far the most common as well as the most generally satisfactory types and probably more than 85% of the amino resin used in this country at the present time is in such combinations. In passing, it may be said that the introduction of the amino resins to the surface coating industry was especially timely in that it was preceded by wide acceptance of the alkyd resins. It is quite conceivable that had the amino resins been introduced prior to this time, their good properties might never have been understood, or at least their development would have been very much retarded.

Practical Aspects

The use of amino resins imparts to an alkyd-amino resin finish improved

Type I	— Very Fast Curing, high color retention, limited compatibility and aliphatic hydrocarbon tolerance, good alkali resistance.
Type II	— Slower curing, excellent compatibility, particularly with mineral spirits soluble alkyds, very high mineral spirits tolerance, high gloss, fair alkali resistance.
Type III	— Good curing properties, excellent compatibility, very high gloss, best alkali resistance.
Type IV	— Essentially same as type III, but offers very wide latitude in active solvent selection.

Table I. Types of melamine resins.

Type I	— High viscosity, fast cure, limited compatibility, general purpose use.
Type II	— Low viscosity, slower cure, much better compatibility, better gloss.
Type III	— Very high mineral spirits tolerance and excellent compatibility, very low viscosity, rather slow cure and high gloss.
Type IV	— Essentially same as type III, but permits wide latitude in solvent selection.

Table II. Types of amino resins based on urea.

AMINO RESINS

Melamine	*Urea*
1. Very much faster cure (Esp. Type I)	1. Lower cost on pound per pound basis.
2. Much better alkali resistance.	2. Can be used with acid catalyst at low temperatures. (125-160° F.)
3. Much better color retention and gloss retention on over baking.	3. Easier patching on rejects, probably because of poorer solvent resistance.
4. Less film shrinkage on curing resulting in better build per coat.	4. Type I yields higher viscosity enamel at equal solids content.
5. Better initial gloss and flow.	5. Holds pattern better in hammertone finishes (Esp. Type I)
6. Much wider baking range (200-500° vs. 225-350° F.)	6. Better adhesion on pound per pound basis.
7. Much better cure in low amino ratio (5-15 per cent)	
8. Better exterior durability (gloss retention, chalk resistance and checking resistance.)	

Table III. General comparisons of melamine and urea resins.

Blistering or Popping	Allow adequate solvent evaporation prior to baking.
Oven Flatting	Provide adequate ventilation in oven.
Gelling of enamel	Select proper alkyd, amino resin and solvent system. Enamels once gelled can often be recovered relatively easily.
Oven Crystallizing	Prevent chlorinated solvents from entering heating chamber.
Poor Adhesion	Insure adequate cleaning of surface prior to coating.
Low Gloss	Check compatibility of alkyd with amino resin.
Soft Film	Inadequate bake time or temperature or alkyd too long in oil or insufficient amount of amino resin.
Sagging	Too much slow evaporation solvent in enamel.
Cratering or Pinholing	Eliminate cause such as oil in air line, excessive anti-foam agents, greasy surface.

Table IV. Formulation with amino resins: common troubles and remedies.

	Melamine Type	*Urea Type*
Exterior Durability	II, III, I	II, III, I
Gloss	III, II, I	III, II, I
Flexibility	III, II, I	III, II, I
Adhesion	II, III, I	II, III, I
Soap and Detergent resistance	III, I, II	I, II, III
Flow	II, III, I	III, II, I
Color retention (heat)	I, III, II	I, II, III
Gloss retention (heat)	III, II, I	III, II, I
Cure Speed	I, III, II	I, III, II
Humidity Resistance	III, I, II	I, III, II
General chemical resistance	III, I, II	I, III, II

Table V. Guide to proper selection of proper type of melamine or urea resin.

Type of Finish	*Most Adaptable Amino Resin*
Automobile body enamel	Melamine Type III or IV
Refrigerator	Melamine Type III urea type II or both
Washing Machine	Melamine Type III urea type I or both
Metal Decorating	Melamine Type IV, urea types III or IV
Heating Appliance	Melamine Type I possibly Type III
Dipping Enamel	Melamine Type II or III
Metal Clears	Melamine Type I, Urea Type II
Wood Furniture	Urea Type I or II Acid Catalyzed
Baking Metal Primer	Urea Type I or II
All purpose baking enamel	Melamine Type I or III Urea Type I or II
Automobile body lacquer	Melamine Type III or Type I
Baking Hammer Finish	Urea Type I

Table VI. Choice of amino resins in several types of industrial finishes.

color, color retention, alkali-resistance grease-resistance solvent-resistance, hardness and mar-resistance. Some loss in flexibility is understandably suffered, but with most melamine resins an improvement in durability is experienced. With the melamine resins the improvements noted above are of much greater degree, generally speaking, than with the urea resins. Melamine resins do, however, detract from adhesion to a greater degree than most urea resins. Compensation for this deficiency may frequently be made simply by reducing the amount of melamine resin in the combination, or by a more judicious choice of alkyd.

In addition to the improved color and color retention effected by the union of amino and alkyd bodies, a still further improvement is possible, since the amino resins permit the use of "non-drying" alkyds in baking finishes and take advantage of the better resistance of such alkyds to discoloration under the influence of both high heat conditions and light. Such an alkyd, by itself, would not form an impervious film but the "new resin" formed as the result of interaction with an amino resin is quite impervious. The resulting thermosetting film is cured practically entirely by interaction and to a very much smaller extent by interpolymerization. In contrast, a straight "drying" alkyd system depends upon the much slower cure mechanism of a combination of heat induced polymerization and oxidation of its aliphatic unsaturation. To continue this contrast, a straight "non-drying" alkyd would be incapable of oxidation or polymerization of its aliphatic modifier and would, therefore, be unsuited as an independent film former.

Prior to the advent of amino resins, this type of alkyd was used almost exclusively as an ingredient in nitrocellulose lacquers.

When formulating with amino resins, the amount to be used depends upon the properties desired. In general increasing amounts of amino resins impart the effects cited to an increasing degree. It is customary in formulating with urea resins not to exceed 50% of the total binder and in the case of melamine not over 40% amino resin. Certain specialty applications can use as high as 90% amino resin.

Formulation with amino resins requires attention to certain precautions in order to avoid some undesirable effects. Listed in Table IV are common troubles and effective means of overcoming them.

In addition to the choice between urea and melamine resins, there is a further choice within each group. As a possible guide to the selection of the

(Turn to page 134)

CELLULOSE ACETATE BUTYRATE

Soluble in low cost solvent combination, wide compatibility, inherent flexibility, and resistance to outdoor weathering are some of the important characteristics of this derivative

By
F. M. Ball
C. R. Lee*

CELLULOSE acetate butyrate of various butyryl contents has been available for approximately 15 years. Many applications in the coatings industry have heretofore been found based upon its excellent weathering and electrical properties, color stability, flexibility, and grease resistance. These are wire and cable lacquers, airplane dopes, lacquers for plastics, gel lacquers and melt coatings.

However, not until recently has cellulose acetate butyrate been available in a form suitable to interest most lacquer manufacturers. The early production was in the form of flake which was not filtered in the manufacturing operation and which gave a somewhat cloudy solution. Now all types and viscosities are being made as filtered powders which form clear, water-white solutions. Again, cellulose acetate butyrate suitable for spray lacquers was not available until early in 1953 when production was started on half-second butyrate, a type which has a viscosity of 0.3-0.5 seconds, yet still retains the good film properties of the higher viscosity esters. It is being investigated in laboratories all over the country and lacquer manufacturers in many diverse fields are already in production on special formulas.

Four general types of cellulose acetate butyrate are available, varying in butyryl content from 17% to 50%. Each type is made in two or more viscosities. The system of nomenclature, based upon the butyryl content, free hydroxyl content and viscosity is explained graphically in Figure I.

F. M. Ball

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As another example, type EAB-500-5 is a cellulose acetate butyrate in the form of a filtered powder containing approximately 50% butyryl, with no appreciable free hydroxyl groups, and having a viscosity of 5 seconds.

Properties

The manner in which the physical properties vary from type to type is indicated in Table 1, which shows that as the butyryl content is increased the moisture resistance improves, but the melting point, hardness and tensile strength decrease.

Table 2 compares the solubilities of the various types in some common solvents. Esters, ketones and nitroparaffins are active solvents, although "Cellosolve" and toluene-ethanol are also solvents for medium butyryl esters.

The compatibilities of the different types with common commercial plasticizers frequently used in lacquers are given in Table 3. (1)

Similarly, compatibilities with resin types are indicated in Table 4. (1) Aryl sulfonamides show widest compatibility, then chlorinated biphenyls, acrylics, rosin derivatives, polyvinyl acetate, many nonoxidizing alkyds and phenolics.

An examination of the foregoing tables reveals that the high-butyryl EAB-500 types have the widest range of compatibilities but give the softest films with the lowest tensile strength.

(*Turn to page 142*)

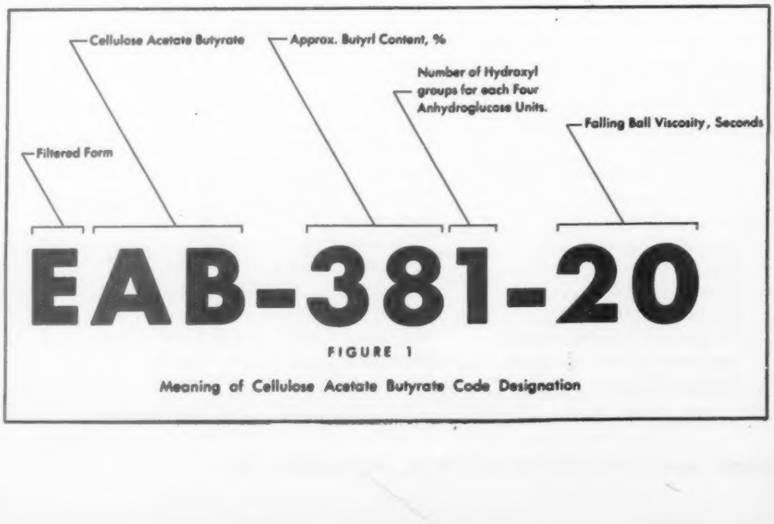


FIGURE 1

Meaning of Cellulose Acetate Butyrate Code Designation

*F. M. Ball and C. R. Lee are connected with Eastman Chemical Products, Inc. (subsidiary of Eastman Kodak Co.), Kingsport, Tenn.

Type	EAB-171	EAB-272	EAB-381	EAB-500
Butyryl content	17.5	26	37	48
Acetyl content	29.5	20.5	13	6
Average melting point, °C	235	212	204*	165
Color (p.p.m.)	150-275	150-500	80-200	100-225
Ash, %	0.04	0.04	0.02	0.04
Density	1.25	1.24	1.22	1.18
Refractive Index	1.470	1.474	1.477	1.471
Hardness	high	high	high	medium
Tensile strength	high	high	medium	low
Moisture resistance	low	medium	medium	medium
General Uses	Cable and wire lacquers, impregnants	Cable and aircraft lacquers, electrical applications	Lacquers for wood, metal, paper, plastics and glass. Heat seal adhesives, melts, and gel lacquers	Peelable plastics, hot melts

*Half-Second Butyrate melts at approximately 155°C

Table 1. Comparison of physical properties of cellulose acetate butyrates and their uses.

Solvent	EAB-171	EAB-272	EAB-381	EAB-500
Hexane	I	I	I	I
Toluene	I	I	I	I
Ethyl alcohol	I	I	I	I
Trichloroethylene	I	I	I	S
80 Toluene 20 Ethyl alcohol	I	SI	S	SI
Ethyl acetate	S	S	S	S
Butyl acetate	I	S	S	S
"Cellosolve"	I	S	S	SI
1-Nitropropane	S	S	S	S
Acetone	S	S	S	S

I = Insoluble

S = Soluble

Table 2. Solubility of cellulose acetate butyrates in solvents.

Plasticizer	EAB-171	EAB-272	EAB-381	EAB-500
Dibutyl phthalate	C	C	C	C
Dioctyl phthalate	C	I	C	C
Santicizer M-17	C	C	C	C
Triacetin	C	C	C	C
Tributyrin	C	C	C	C
Tricresyl phosphate	C	C	C	C
Triphenyl phosphate	C	C	C	C
Ethyl benzoate	C	C	C	I
Dibutyl sebacate	C	C	C	C
Butyl adipate	I	C	C	C
Raw castor oil	I	I	C	I
Blown castor oil	I	I	I	I
Camphor	C	C	C	I

C = Compatible

I = Incompatible

Table 3. Plasticizer compatibility of cellulose acetate butyrates in 1 to 4 ratio.

TYPE OF RESIN	EAB-171	EAB-272	EAB-381	EAB-500
Alkyds Phenolics Ureas Maleics Polyesters	Compatibility depends on modifiers used in resins. Many resins of these types designed for lacquer use are compatible, particularly with EAB-381 types.			
Aryl sulfonamide-formaldehyde condensates Modified hydrocarbons	Compatibility very good			
Chlorinated biphenyls	Good		Very good	
Acrylates	Fair	Good	Very good	Fair
Rosin derivatives	Fair		Generally good	
Polyvinyl acetates	Fair	Very good	Good	Poor
Polyvinyl chlorides Polyvinyl chloride-acetates Polyvinyl acetals	Generally not compatible			
Unmodified hydrocarbons Melamines Furfurals	Generally not compatible			
Alkyd resin plasticizers	Fair	Generally good		

Table 4. General compatibility of resins with cellulose acetate butyrate.

CELLULOSICS

Entrenched nitrocellulose is still one of the most important cellulose derivatives for the manufacture of lacquer finishes; recent use in one coat multi-color finishes demonstrates the versatility of this derivative; ethyl cellulose and cellulose acetate find use in specialized products

THIS ARTICLE is concerned with four important cellulose derivatives which are currently being used in the manufacture of lacquer finishes. These include ethyl cellulose, cellulose acetate, nitrocellulose, and of more recent vintage, ethyl hydroxyethyl cellulose.

With such a group of resins available, the lacquer formulator is able to develop finishes having a wide range of properties for wood, metal, plastics, leather, paper, linoleum, and textiles—to mention a few.

Ethyl Cellulose

Satisfactory formulation of ethyl cellulose lacquers and their good performance depend, largely upon selection of the proper kind and proportion of modifying agents to meet the requirements of each case. One has a relatively wide choice of solvents, resins, and plasticizers.

In general, ethyl cellulose has been found to yield lacquers of excellent toughness and flexibility. These properties are, in turn, retained over a wide range of temperatures, extending from low to high. Ethyl cellulose lacquers, for example, may be formulated to be unusually resistant to cold checking. Furthermore, they can be formulated to retain their color extremely well on exposure to sunlight. Although ethyl cellulose is slightly more sensitive to water than is nitrocellulose, its lacquers may be formulated to correct this shortcoming.

Generally, tests and experience to date indicate that ethyl cellulose lacquers are just as durable as conventional nitrocellulose lacquers, provided the other lacquer ingredients are properly chosen. Metal, wood, leather, and rubber lacquers all have been found useful fields for application of the specific properties of ethyl cellulose.

Examples of approaches to the formulation of ethyl cellulose lacquers for special purposes are given. A hard lacquer for application on rigid surfaces will be given first. Such a lacquer should give satisfactory service where a tough, crack-resistant lacquer is desired on a rigid surface exposed to extremes of outdoor temperature.

Hard Lacquer for Rigid Surfaces

Materials	Parts by Weight
Ethyl cellulose, N-22 type	10
Super-Beckacite 1001, Aroclor 5460 or equivalent	10
Tricresyl phosphate	3
Octylphenol	0.23
Alcohol	11.67
Butanol	3.90
Toluene	46.60
Xylene	14.60
Total	100.00

Tough Lacquer: Many lacquer applications on nonrigid surfaces require, as basic desired properties, toughness, wear resistance, and good adhesion. Such properties are required in lacquers for paper, linoleum, home-recorder records, cellophane, surgical tape, wet-or-dry sandpaper, and lacquers for the decoration of textiles. A starting formula for such a lacquer may be based upon the following formula:

Tough Lacquer

Materials	Parts by Weight
Ethyl cellulose, N-22 type	10 to 14
Diphenyl phthalate	10 to 6
Octylphenol	1
Ethanol	12
Butanol	4
Toluene	48
Xylene	15
Total	100

This type of lacquer shows excellent flexibility over a wide temperature range. It resists discoloration and has good alkali resistance. The formulator can adjust the ethyl cellulose-plasticizer proportion to suit the specific need. For example, lacquers for surgical tapes and wet-or-dry sandpaper might contain the smaller quantities of plasticizer. In the production of a paper-coating lacquer a small amount of resin might even be added to increase adhesion or heat-sealing properties. Minor modifications in other ways can be worked out.

Varnishes

Use of ethyl cellulose in certain types of varnishes gives to them the inherent toughness and quick-drying properties associated with the cellulose derivatives. The addition of ethyl cellulose to some varnishes reduces drying time appreciably, increases toughness, reduces the necessary amount of metallic drier, reduces surface tack, and improves their resistance to rapid temperature changes.

This article was prepared by the technical staff of the Hercules Powder Co., Wilmington, Del.

Cellulose Acetate Lacquers

Properly formulated cellulose acetate lacquers are characterized by combined excellence in toughness, resistance to outdoor weathering, light stability, and low flammability. Starting formulas are given later to illustrate basic principles in cellulose acetate lacquer formulations.

Choice of solvents and film modifiers must be made with care, since useful solvents and modifiers are more limited than is the case for nitrocellulose and ethyl cellulose. Because of these limitations, cellulose acetate is used primarily in specialty lacquers.

Paper lacquers having excellent resistance to grease, heat, and solvent are based on cellulose acetate. Plastics coatings, flame-resistant lacquers, cloth finishes, and cable lacquers and dopes are other specialty compositions made of cellulose acetate.

The L and F types of *Hercules* cellulose acetate (of 54-56 per cent combined acetic acid) are commonly used for lacquer formulations. These types, with the highest combined acetic acid content, show good solubility in lacquer solvents.

The low-viscosity grades of cellulose acetate yield lacquers of satisfactory strength; but where the maximum in strength is required, a high-viscosity type is preferable. These higher viscosity types may be used even in brushing, roller-coating, and knife-coating lacquers.

Outdoor durability is affected somewhat but not greatly by level of combined acetic acid content, with those types having the higher percentages tending to be somewhat better than types with lower combined acetic acid content.

Pigmented cellulose acetate lacquers having low pigment-to-vehicle ratios usually give better durability than those with high ratios. Of the pigments tested, zinc oxide gives the best weather resistance on the basis of experience so far recorded.

In cellulose acetate lacquers, the higher resin-to-cellulose acetate ratios have been observed to give the better weather resistance. Selection of the resin as well as the plasticizer, for best results, is critical because they must be completely compatible and the number of such resins is limited. It is of interest, also, to note that experimental tests indicate that some resins show preferential adhesion for any given substrate. In the examples given, the resins cited, of all those tested, according to the Hercules Powder Co., showed strongest adhesion for the given substrate:

For aluminum—Durez 500 and Santolite K

For copper—Santolite K and Santolite MS

For glass—Durez 500 and Vinsol

For plastics—Rezyl 14-7E-75, Santolite K, and Vinsol

For wood—Santolite MS

As in other lacquers, resins in cellulose acetate lacquers tend to improve not only adhesion, but also gloss and water resistance, and to lower costs; while plasticizers tend to soften the film, and to improve flexibility and water resistance.

The proper balance of the solvent to prevent a cellulose acetate lacquer from blushing should receive special attention because the lower boiling range and more rapid evaporation of the solvents generally used tend to cause blushing more readily. Therefore, evaporation rate and dilution ratio of cellulose acetate lacquers must be carefully considered.

In a spraying lacquer, only about one-half the diluent which a formulation can tolerate should be used if good flowout is to be achieved. High percentages of diluents, particularly of aliphatic, can cause pebbly films

Examples of Lacquer Formulas

Since many variables must be taken into consideration in the formulation of cellulose acetate lacquers, the formulas given are intended only as starting formulations, not as finished lacquers for specific needs. To the skilled formulator unfamiliar with cellulose acetate lacquer, it is hoped these starting formulas can serve as guides to his more quickly arriving at satisfactory lacquers for specific needs.

Formula B—Clear Outdoor Lacquer

Solids	% by Weight
Cellulose acetate LL-1	40.0
Rezyl 14	40.0
Santicizer M-17	20.0
	100.0
Solvents	
Methyl acetate	15.0
Nitromethane	32.0
Cellosolve acetate	8.0
Ethanol	18.0
Toluene	27.0
	100.0
Properties	
Per cent solids	20.0
Viscosity, seconds by Ford No. 4 cup	74
Color (Gardner scale)	1
Weight, pounds per gallon	8.6

Nitrocellulose Lacquers

The usefulness of nitrocellulose has been demonstrated many times through the past half century. In protective finishes, for example, it still gives the quickest drying finish known. Furthermore, such finishes are tough and give long and satisfactory performance. It can be applied in various ways.

Nitrocellulose has pioneered many new uses. Some of these it has passed on to other materials, as that of the sandwich in safety glass. Others, such as fast-drying finishes, it has continued to serve because of markedly advantageous characteristics. Nitrocellulose continues to be a pioneering product; and it is hoped that the information presented here will continue to be an aid to the pioneering industrialist as well as to those using it in already well-established fields.

The big growth in the use of the soluble nitrocellulose dates from shortly after the end of World War I, when expansion of the automobile industry created a demand for quick-drying finishes to fit in with assembly line manufacturing methods. Since then a variety of uses for quick-drying, durable nitrocellulose finishes has developed.

Metal Lacquers

Metal lacquers are generally pigmented for the added protection and decoration features they give. Among the requirements wanted in metal lacquers, depending upon application, are: outdoor durability in various climates, high gloss retention, rubbing and polishing quality, salt spray resistance, adhesion, and flexibility.

Pigmented High-Solids Lacquers.

Much work has been done in *Hercules Laboratories* on the formulation and outdoor durability of pigmented lacquers of high solids content. The details of these investigations are available at Hercules Experiment Station. The following summaries of the main points found will indicate to the technologist important factors in formulating that this type of lacquer can give.

1. Pigmented lacquers of high solids content, of good outdoor durability, and with practical application properties could be formulated through proper choice and combination of ingredients.

2. Nonoxidizing alkyd resins were found to be especially suited to this type lacquer. These resins, give better results than did either the oxidizing alkyd or nonalkyd resins.

3. Nonoxidizing alkyds at ratios of 1:1 and 1:2 nitrocellulose:resin gave, generally, lacquers of good durability, but with a tendency toward imperfect adhesion which could be corrected by small additions of plasticizer.

4. Additions of small amounts of certain nonalkyd resins, along with the nonoxidizing alkyds, improved overall lacquer performance.

5. Blends of nonoxidizing and oxidizing alkyds yielded good lacquers when the proportion of oxidizing alkyd did not exceed that of the nonoxidizing alkyd

6. When oxidizing resins alone made up the resin component of the lacquer, either lifting or poor durability invariably showed up.

7. Lacquers with black or blue pigments were more resistant to weathering effects than were those with white pigments. The pigments used were: Black, 6 per cent carbon black; blue, 16.8 per cent blue with 0.7 per cent rutile-type titanium dioxide; white: 25 per cent rutile-type titanium dioxide.

8. Checking was the dominant type of failure.

9. Chalking, a frequent type of failure in standard pigmented commercial lacquers, rarely occurred in these high-solids pigmented lacquers.

Wood Lacquers

Nitrocellulose lacquer is the preferred finishing material for home and office furniture, store fixtures, pianos, and radio and television cabinets because of its fast dry, ease of application, and permanence. Lacquers bring out the natural beauty of the wood and at the same time protect it. Nitrocellulose may be used to advantage as the major film-former in wash coats, toners, sealers, and topcoats.

Wash Coats. Wash coats are dilute solutions of lacquers applied directly over the bare wood, or over the stain. They even the irregularities in texture of the wood, make filling easier, and provide a good base for further finishing. A typical formula for a lacquer wash coat might be:

Lacquer Wash Coat

	Parts by Weight
RS Nitrocellulose, 5-6 sec. (70% solids)	4.5
Dewaxed shellac	2.0
Ethyl acetate	18.0
Butyl acetate	14.0
Ethanol	14.0
Toluene	47.5
	100.0

In commercial practice wash coat lacquers are not formulated specifically, but are usually made by reducing a topcoat lacquer with 3 to 5 volumes of lacquer thinner.

Toners: Toners are pigmented lacquers applied as dilute solutions to bare wood. They may be used to simulate bleaching, to lighten the color of the wood, or to achieve special effects. Toning tends to hide the grain and to cover minor blemishes.

Sanding Sealers: The sealer is the first coat of lacquer applied in a furniture-finishing system after the staining, toning, wash coat, and filling operations. A lacquer sealer provides a smooth adhesive base for lacquer topcoats. Most sealers are intended to be sanded and a "sanding aid" such as zinc stearate is usually incorporated. A typical formula for a lacquer sanding sealer is:

Lacquer Sanding Sealer

	Parts by Weight
RS Nitrocellulose, ½ sec. (solids basis)	38.0
Cellolyn 104	43.0
Raw castor oil	7.0
Dibutyl phthalate	7.0
Zinc stearate	5.0
	100.0

Topcoats: Lacquer topcoats protect and enhance the appearance of the furniture. They must be formulated to balance easy rubbing, cold check resistance, and high solids. Most furniture lacquers are made with varying percentages of the following four ingredients:

a. Nitrocellulose

b. Hard brittle resin

c. Soft plasticizing resin

d. Plasticizer

The nitrocellulose contributes film strength, toughness, durability, hardness, and (most important of all) cold check resistance. A hard brittle resin such as ester gum or Cellolyn 102 imparts adhesion, gloss, and build, while at the same time it lowers the cost of the lacquer. The plasticizer add flexibility, cold check, resistance, and softness.

Ultraviolet Absorber: The addition of about one-half per cent of a special ultraviolet absorber such as Uvinul 490 effectively retards the natural darkening of many woods and helps retention of the original color of the finished furniture.

Flatting Agents: In some cases it may be desirable to obtain the appearance of rubbing without performing that operation. This may be done by dispersing colloidal in the lacquer flatting agents such as metal soaps (aluminum stearate), silica (Santocel C or Syloid 308), or insoluble waxes (carnauba).

Methods of Application

The production of raw materials and the preparation of lacquers for the multitude of end uses are climaxed by the final applications of the lacquer coatings. This step is highly important, since the best of coatings can be poorly applied. The method of application must be chosen with care, to obtain the most suitable film at the most reasonable cost. Lacquers used must be tailored to the method of application.

All of the standard techniques of applying protective coatings can be used for the application of lacquer. A number of possibilities are briefly discussed.

Cold-Spray Applications

The majority of lacquer coatings are applied by standard spray methods at room temperature. Cold-spray lacquers are readily formulated and are suitable for a multitude of products. The solvents usually consist of combinations such as are indicated here:

Cold-Spray Lacquer Solvents

Active Solvent	20-50%
Alcohol Cosolvent	10-25%
Diluent (Aromatic or Aliphatic)	30-60%

Hot-Spray Applications

The proportion of lacquers applied by the hot-spray process has increased markedly in recent years. With this procedure lacquers are formulated in a manner similar to cold-spray lacquers, but higher boiling solvents are used. The solids content and viscosities are higher than for cold-spray lacquer formulations, with viscosities of 40 to 100 seconds, No. 4 Ford Cup, being widely accepted. The viscosity is reduced by heat before spraying.* Several advantages are realized through the use of heated lacquers. Since viscosity and solids content are higher than for lacquers applied at room temperature, thicker coats can be applied per pass with substantial savings in coating time and labor. Also, solvent costs are less due to the higher solids used. The presence of medium or high boiling solvents improves flowout, reduces orange peel and thus gives improved unrubbed glossiness. A minimum of rubbing and polishing is necessary to obtain a high-quality finish. The controlled temperature provided by the hot-spray process eliminates blushing problems and day-to-day variations in spraying temperature and viscosity.

Aerosol Lacquers

Special lacquers, usually nitrocellulose, are now packaged in aerosol dispensers. Because of their rapid drying rate, these aerosol lacquers have proven ideal for touch-up work and for refinishing small household objects.

(*Turn to page 106*)

*Hot spray lacquers are discussed in Hercules booklet, "Hot Spray Application of Lacquers," which is available upon request.

CHLORINATED RUBBER

Alone or in alkyd combinations, this resin has found application in formulating finishes having moisture-, acid-, alkali-, mold-, and mildew-resistant properties

By
Fred K. Shankweiler*

F. K. Shankweiler

OUTSTANDING because of their resistance to corrosive elements including chemicals, alkalis, acids, mold and mildew growths, finishes based on (chlorinated natural rubber) are now in widespread use as maintenance paints and finishes for original equipment. Parlon** paints are especially fitted for use under conditions too severe for regular paints and enamels, making them ideal for use in general maintenance and industrial painting. When required, they can be successfully applied without extensive preparation of the surface, making their use feasible in many installations where other finishes cannot be properly applied.

Chlorinated rubber, as a concrete finish, provides two-way protection, being resistant to the attacks of alkalis present in concrete and at the same time able to withstand corrosive agents attacking the outer surface. On metal, chlorinated rubber gives extra protection because of its impermeability and resistance to acids, alkalis and chemical fumes.

Ease and economy in application are outstanding features of chlorinated rubber finishes. Such paints may be applied by brush or spray (in addition, product finishes by dip-or flow-coating) and usually simple wire brush cleaning is sufficient surface preparation to obtain good anchorage for the paint film. In critical applications, greater durability and longevity is achieved by sandblasting the surface to be painted. The thinned paint itself can be used as a primer on concrete. Special primers based on this resin are available for finishing systems applied to metal to build up an adequate film as protection against extreme exposures to corrosive elements.

Among the most widespread uses for chlorinated rubber maintenance finishes is that in water works and sewage disposal plants where condensation, moisture, chemical fumes, and gases continually attacks paint surfaces. Parlon's rich range of colors, plus unmatched durability, make it ideal for use in this field. The similar moisture problems posed by all types

(Turn to page 145)

*Fred K. Shankweiler is manager of Chlorinated Product Sales, Hercules Powder Co., Wilmington, Del.

**Parlon is the registered trademark for chlorinated natural rubber as produced by the Hercules Powder Co.

Vessels shown are stainless steel, but all other metal parts of each unit are painted with chlorinated rubber paint. Operator is at work on glass lined hydrolysis tank containing dextran solution being treated with hydrochloric acid. All exterior parts of twin tanks are chlorinated rubber painted.

Another application of chlorinated rubber finishes. Fractionation tanks show excellent condition of chlorinated paint used on motor jacket and mixing mechanism. It is constantly exposed to alcohol spillage and fumes and has required only touch-up where surface is chipped.

EPOXY RESINS

Range of properties such as adhesion, toughness, flexibility, chemical, solvent resistance are possible in epoxy-, phenolic, urea, melamine, fatty acid, polyfunctional amine combinations

By
T. R. Hopper*

T. R. Hopper

EPOXY resins can be used in three basic ways as industrial finishes:

1. As heat converted films with urea or phenolic resins,
2. As ester combinations with fatty acids, which, in turn, are generally modified with melamine or urea resins in baked coatings, and
3. As films converted either at room temperature or elevated temperatures with polyfunctional amines—diethylene triamine, ethylene diamine, etc., or with certain amides like the polyamide resins.

In each case the qualities of excellent adhesion and flexibility and superior chemical resistance attributable to this resin are apparent in the coating. Three different types of Epon† resin coatings are now widely accepted in industrial finishing for the solution of many difficult coating problems. A discussion of these three basic systems follows, stressing formulating techniques, film properties and end-uses.

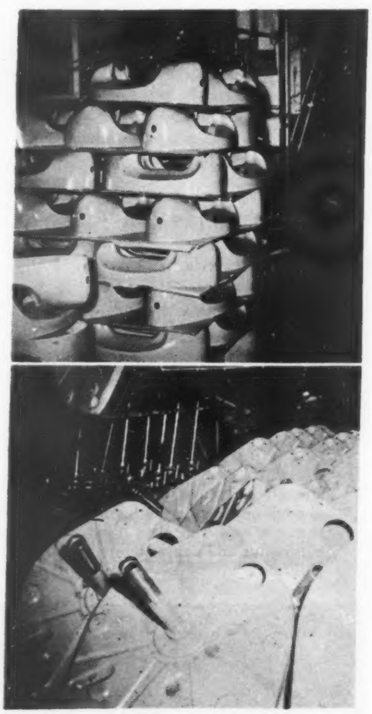
The Epon resin types most frequently used in coatings, Epon resins 1001, 1004, 1007, and 1009, are basically the same in composition, differing only in molecular weight. They are polymeric products obtained by reacting epichlorohydrin with bisphenol-A, and contain both epoxy and hydroxyl groups capable of further reaction. Physically they are light-colored, frangible solids melting from 65 to 150° C. Solvent blends containing up to 50% of active ketone or alcohol solvents are normally used with the resins, since they have limited solubility in hydrocarbons. Each of these types has a fairly specific role in industrial finishing. 1001 resin is best suited for conversion through the epoxy group with amines; resins 1004 and 1007 make the most practical esters; and resins 1007 and 1009 are used with urea-formaldehyde and phenol-formaldehyde resins in heat converted films.

Use with Ureas and Phenolics

Epoxy resin films of maximum chemical resistance, hardness and solvent resistance are obtainable with the urea-formaldehyde and melamine-formaldehyde converted systems. When properly cured, these films exhibit extraordinary resistance to acids, alkalies, detergents, solvents, many industrial chemicals, and water. The phenolic modifications are better in resistance properties than the urea resin systems, but they have somewhat poorer color and require higher baking temperatures. In using these systems in chemical service, it is far better to overbake than to risk an undercured film.

Phenolic System

Epon-phenolic combinations are widely used in can coatings, drum finishes, in tank car linings, and in other applications where high chemical resistance is required and flexibility for this coating has resulted from formulations containing approximately 75% of Epon 1007 or 1009 and 25% of phenolic resin. A small amount of phosphoric acid is required in this system to catalyze the



Epoxy resin coatings are used on washing machine wringer shrouds (top) and the chassis base plates (bottom). These coatings will protect against abrasion and soap solution corrosion. Such finishes are strongly adhesive, and withstand shocks found in household useage.

*T. R. Hopper is connected with the Technical Service Laboratory, Shell Chemical Corp., Union, N. J.

†Trade Name: Shell Chemica

polymerization reaction. The presence of this acid, however, has no effect on solution stability. A wide variety of phenolic resins are applicable, but best results are obtained with G. E. R-108 (now Methylon[1] 75108), Resinox[2] P-97, Durez[3] 15956, and Varcum[4] 2896-B.

In the preparation of the epoxy-phenolic vehicle, the Epon resin is dissolved in a suitable solvent system (suggested: toluene 50, ethanol 25, MEK 15, pine oil 10; or other combinations of aromatic and ketone type solvents) to about 40%nvm; the phenolic resin is then blended in with good agitation. To complete the vehicle, solutions of the phosphoric acid and a flow control agent (Silicone Resin[1] SR-82) are added slowly with good agitation, and the resulting solution is thinned to 30-35%-nvm (normal spray viscosity).

Epon 1007-phenolic combinations may easily be pigmented, but good whites cannot be obtained because of the phenolic resin present. Where chemical resistance is paramount, multiple coats of the system are applied. To insure proper knit between coats, each succeeding coat must remain undercured until the final bake. A common finishing schedule used in multicoating is:

Bake after each undercoat	10 min. at 300° F.
Bake after final coat	60 min. at 350° F.

Urea Resin System

The Epon resin-urea resin system is prepared in the same manner as the phenolic system, and the same solvents may be used. However, it is not necessary to use a flow control agent or phosphoric acid with this system, and the ratio of epoxy resin to modifier is 70:30 instead of 75:25. Curing is effected on clear films at temperatures ranging from 300° F. to 385° F., depending upon the urea resin used.

The color of films made from this system is very good, and excellent whites can be formulated. These films, again, possess excellent resistance to a wide variety of chemicals and solvents, and are only marginally inferior to their phenolic counterparts. Large scale, industrial uses of Epon-urea coatings are in the finishing of metal furniture for hospitals and laboratories and as primers for washing machines.

Epoxy Resin Esters

Epoxy resin esters based on Epon 1004 or 1007 and soy, coconut, and dehydrated castor acids are vehicles comparable to short-oil alkyds in appearance, properties and uses, and they find similar applications in baked finishes. These vehicles, however, show chemical resistance properties in films that are greatly superior to all other oil modified systems. In industrial coatings, the Epon resin esters are normally combined with 25-40% of melamine or urea resin in baked finishes used as appliance primers and top coats, can coatings and in chemically resistant finishes for metal. Hard, durable films are obtained after baking for 30 minutes at 300° F.

For esterification purposes Epon 1004 and 1007 have been found to give vehicles of the best properties. The Epon resin enters into the esterification reaction as a resinous polyol, with both the hydroxyl groups situated along the polymer chains and the epoxy groups at the ends being esterified. In the case of Epon 1004, the Epon type most widely used for esters, the equivalent weight of the resin (the amount that would completely esterify one equivalent of dibasic acid) is 175 grams per mole. The higher molecular weight resins have greater equivalent weights.

Calculations of charge weights for ester formulations parallel closely the methods used for alkyds. For example, Epon Ester D-4, a dehydrated castor ester in which 0.4 of the available reactive groups of Epon 1004 has been esterified, has this composition (See Table I).

Epon resin esters can be prepared with varying amounts of fatty or rosin acids to yield a wide range of properties. The short esters, in the 0.4 to 0.5 esterification range, have low solubility in mineral spirits, are normally prepared in xylene, and find use chiefly in combination with melamine and urea resins in baking enamels. Long esters, in the the 0.7 to 0.9 range, can be prepared in mineral spirits, and have found use in durable air-dry finishes rather than in industrial paints.

Standard alkyd equipment, either open or closed kettle, can be used for preparing these resin esters. The top cooking temperature is usually 500° F., yielding short esters in the 0.4 range in

(*Turn to page 118*)

The white-painted items of equipment in this laboratory, including bench tops and stools, have a coating based on an epoxy resin system. In an electrolytic laboratory, this equipment is subjected to caustic solutions of various concentrations and to mixtures of 25 percent sulfuric acid with small amts. of chromic acid.

Table I. Composition of Epon Ester D-4.

EPON ESTER D-4

	Eq. Wt.	*Equivalents*	*Weights*	*% Comp.*
Epon 1004	175	1.0	175	60
Dehydrated Castor Acids	288	0.4	117	40

1 General Electric Co.
2 Monsanto Chemical Co.
3 Durez Plastics and Chemicals, Inc.
4 Varcum Chemical Corp.

POLYAMIDE·EPOXY RESINS

Shock and impact resistance, flexibility, good adhesion, high gloss, resistance to alkali, chemicals, water, oil, and grease may be obtained with various combinations of this blend

THANKS to the two container coating system based on polyamide resin-epoxy resin blends, it is possible to achieve many properties of a baked finish without baking.†

For example, combinations of General Mills reactive Polyamide Resins[1] 100 and 115 with epoxy resins can result in finishes with a high degree of shock resistance, exceptionally high impact resistance, extreme flexibility, good adhesion to many different surfaces, outstanding gloss, a high degree of resistance to alkali and to a wide range of chemicals, and excellent water vapor, water oil and grease resistance.

Such properties make these thermosetting compositions important to large paint companies for industrial finishes as well as to specialty coating manufacturers.

In addition to coatings for wood, metal and glass, the polyamide-epoxy blends have proved themselves outstanding when applied to flexible substrates such as paper, foils and plastic films.

On wood and metal, the coatings are formulated for application by any of the conventional procedures. On flexible substrate, application can be made by roller coating, rotogravure presses, or by silk screening.

Adhesion is excellent for both porous and non-porous surfaces—including plastic films.

Films cure at room temperature. Application of mild heat makes them better. Either way, the resulting films are hard and very glossy with high abrasion resistance. On exterior exposure, the films chalk, and thus may be said to be self-cleaning. When the chalked area is rubbed off, the film beneath is still extremely glossy. Salt spray resistance is excellent.

Advantages

The polyamide resin-epoxy resin blends have five advantages as compared to amine-cured epoxy films. (1) The polyamide-epoxy combinations have considerably longer pot life. (2) There is no volatile, toxic curing agent. (3) The use of the polyamide resin usually provides a cost saving. (4) The films from the polyamide system are much more flexible. (5) Many more formula adjustments of the ratio of polyamide to epoxy resin are possible than with the amine cured system. This makes it possible to control the whole range of coating properties with the polyamide-epoxy system. A change from one resin grade to another or a change in resin ratio results in different degrees of hardness, flexibility, rate of cure and impact resistance. This, of course, adds versatility to ease of formulating the coatings for application by spray gun, roller coater, brush, or, in the case of paper, rotogravure machine.

Specific research data on the polyamide resin-epoxy resin combinations has just been released by *General Mills* in Technical Bulletin 11-4-3.

Specific Properties

Hardness and Flexibility: Flexibility increases and hardness decreases as the ratio of Polyamide Resin 100 to epoxy resin is increased. A 1.5 mil coating comprised of equal parts of Polyamide Resin[2] 100 and Epon[3] 1001 will attain the hardness of a commercial floor varnish (Sward Rocker 20-30) after 1 day's curing at room temperature and the hardness of a baked enamel (Sward Rocker 40-60) after 4 to 7 days. The same hardness may be reached by baking for ½ hour at 200°F. or 10 minutes at 300°F. This baked coating combines a high degree of hardness with an impact resistance of 30 inch pounds on tin plate or 172 inch pounds on 22 gauge steel plate.

Adhesion: The Polyamide Resin 100-epoxy compositions display excellent adhesion to a wide variety of surfaces including glass, metal, wood, and most plastics.

Resistance to Chemicals: Completely cured blends of Polyamide Resin 100 and epoxy resins generally have good resistance to many solvents, aqueous mineral acids and strongly alkaline solutions. Immersion in a 5% caustic solution at room temperature for 3 months has no effect on adhesion, color or hardness. These coatings also have outstanding salt water and salt spray resistance. For even better resistance to organic solvents, Polyamide Resin 115 (Technical Bulletin Series 11-0) should be substituted for Polyamide Resin 100.

Gloss: Polyamide Resin 100-epoxy coatings have exceptionally high gloss.

This article was prepared by the Research Laboratories of General Mills, Inc., Minneapolis, Minn.

†Renfrew, M. M., Witcoff, H. Floyd, D. E., and Glaser, D. E. "Coatings Based on Blends of Polyamide and Epoxy Resins", Ind. and Eng. Chem. (In press).

1. General Mills, Inc.

2. Polyamide Resin 100 is a soft, tacky resin. It is an excellent thermoplastic adhesive for many applications and also functions as a plasticizing resin. Additional information may be found in Technical Bulletin Series 11-.

3. Shell Chemical Co.

Durability: After 3,000 hours in a Weather-Ometer, films from blends of Polyamide Resin 100 (60-50 parts) and Epon 1001 or 864 (40-50 parts) were not seriously damaged. Gloss reduction resulted from the exposure but simple polishing restored the luster of the film. No checking, cracking, or other defects destroying film integrity occurred.

See Tables I and IV for more complete data on properties of baked films and films cured at room temperature.

Compatibilities

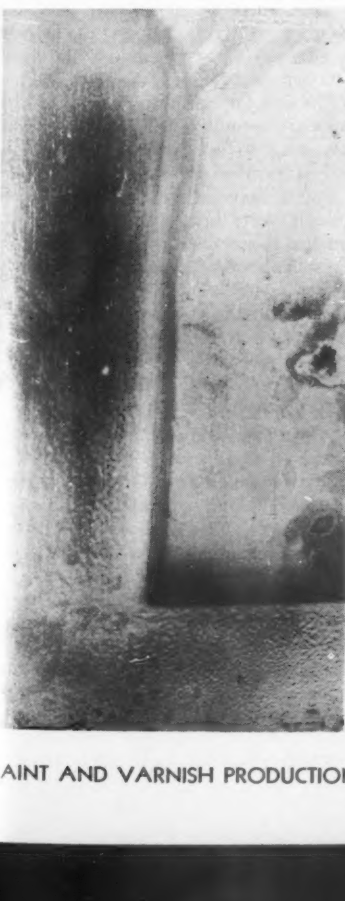
A partial list of epoxy resins with which Polyamide Resin 100 is compatible is presented in Table II. This table also presents the film properties of the cured products. By changing the ratio of Polyamide Resin 100 with epoxy resin, it is possible to attain a range of properties.

Preparation of Blends

Solvents such as isopropanol and Cellosolve are primary solvents for solutions of Polyamide Resin 100 containing 30-50% solids. Mixtures of alcohols and aromatic hydrocarbons are the most satisfactory solvent systems, however. For example, Polyamide Resin 100 may be dissolved at the 60% level in a blend of toluene and isopropanol (1:1) or xylene and Cellosolve[4] (9:1). The epoxy resins are soluble in solvent combinations such as methyl ethyl ketone and toluene, methyl isobutyl ketone and xylene, or xylene and Cellosolve (9:1). For some applications, the addition of a small amount of Cellosolve or butyl Cellosolve may be desirable.

The polyamide and the epoxy solutions are combined just prior to use because the ingredients react after mixing and have a limited usable life. When a blend contains 50% or more Polyamide Resin 100, gelation of the solution (50% solids) may occur after 3 days storage. However, no pronounced increase in viscosity will occur up to 8 hours after blending. Lower solids content as well as re-

Photo shows results of exposure testing of a pigmented polyamide resin/epoxy resin film on a metal panel. The film was exposed in Fla. for 1 yr. Upper portion was covered and represents the original film. The right side of the panel has been cleaned with a sponge and has thus regained most of its initial gloss.



GMI Polyamide Resin 100 — Epon Resin Compositions

Metal and Wood Coatings

Coating Compositions and Properties								Pigmented*				
Pebble or Ball Mill Base	**Lbs.**	**Clear Gals.**	**Wt. %**	**Lbs.**	**White Gals.**	**Wt. %**	**Lbs.**	**Yellow Gals.**	**Wt. %**	**Lbs.**	**Blue Gals.**	**Wt. %**
Epon Resin 1001	600	60.0		600	60.0		600	60.0		600	60.0	
Xylene	300	41.5		300	41.5		300	41.5		300	41.5	
Methyl Isobutyl Ketone	300	45.0		300	45.0		300	45.0		300	45.0	
Titanox RA50				850	24.3					850	24.3	
C.P. Medium Chrome Yellow							1295	25.9				
Copper Phthalocyanine Blue										24	1.9	
Wetting Agent										**		
TOTALS	1200	146.5	38.1	2050	170.8	51.3	2495	172.4	56.2	2074	172.7	51.6
Polyamide Resin 100 Solution B (60% Nonvolatile in a 4:1 Ratio of Xylene, Butanol)	1000	129.6	31.7	1000	129.6	25.0	1000	129.6	22.5	1000	129.6	24.8
Reducer												
Xylene	760	106.0		760	106.0		760	106.0		760	106.0	
N-Butanol or Isobutanol***	190	28.1		190	28.1		190	28.1		190	28.1	
TOTALS	950	134.1	30.2	950	134.1	23.7	950	134.1	21.3	950	134.1	23.6
SUM TOTALS	3150	410.2	100.0	4000	434.5	100.0	4445	436.1	100.0	4024	436.4	100.0
Properties												
Viscosity of Base		Gardner Tube – A			Stormer 90 K.U.			100 K.U.			90 K.U.	
Viscosity of Total Mix – No. 4 Ford Cup		20 Sec.			21 Sec.			24 Sec.			24 Sec.	
% Non Volatile in Vehicle		38.1			38.1			38.1			38.1	
% Non Volatile in Total Mix		38.1			51.3			56.1			51.6	
Base Surface	Wood		Steel	Wood		Steel		Properties Similar to Whjte				
Baking Temperature °F	140°		300°	140°		300°						
Baking Time (minutes)	90		15	90		15						
Gardner Impact Resistance on 22 Gauge Steel (inch-lb.)				172+		172+						
Sward Rocker Hardness			59			60						

* A variety of other colors may be readily prepared.

** Ten LO-70 (Griffin Chemical Co.) and lecithin have been found to be effective antifloat agents. DC-200 oil (Dow Corning) may also be used but with great care.

*** Small amounts of Cellosolve of Butyl Cellosolve may be used if necessary to produce desired levelling properties.

Table I

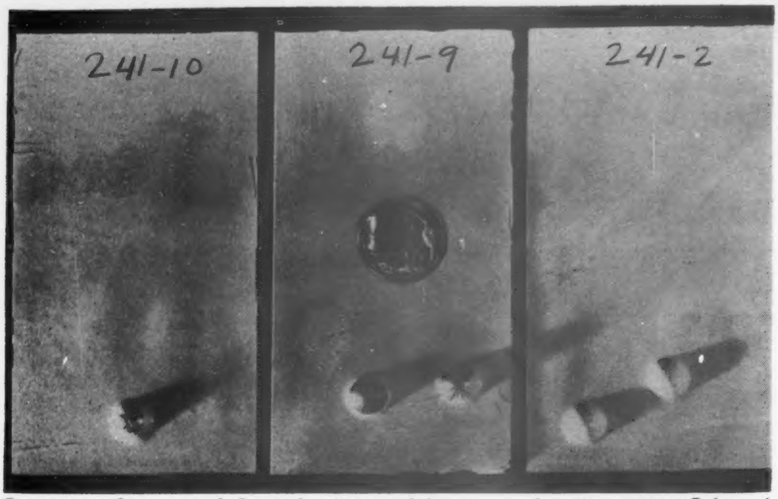
A Partial List of Epoxy Resins With Which Polyamide Resin 100 Is Compatible

Epoxy Resin	Supplier
HARD RESIN	
Epon 1001	Shell
Epon 1004	Shell
Epon 1007	Shell
Araldite CN-501	Ciba
SOFT RESIN*	
Epon 828	Shell
Epon 834	Shell
Epon 864	Shell
Epon 1062	Shell
Araldite AN-101	Ciba
Araldite AN-102	Ciba
Araldite CN-503	Ciba
Araldite CN-504	Ciba
Epiphen XR-828	Borden
Stabilizer 909	Ferro Chemical
Bakelite 18794	Bakelite
Bakelite 18795	Bakelite

*These soft epoxy resins are compatible with Polyamide Resin 100 and will react to form useful products. The principle application of the soft epoxy resins, however, is with Polyamide Resin 115 which is fluid enough to make possible blending without the use of solvents.

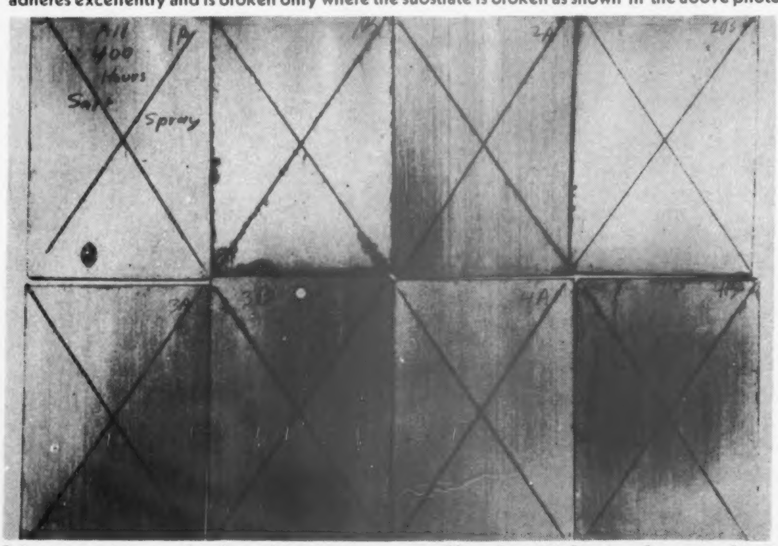
Table II

4. Carbide and Carbon Chemicals Co., Div. of Union Carbide and Carbon Corp.



Comparison of impact and chemical resistance of three types of coatings: 241-2 Polyamide Resin 100-Epon 1001 (1:1); 241-9 alkyd-melamine baking enamel; 241-10 silicone-alkyd baking enamel. Upper part of each panel has been exposed to 20% NaOH for 1 day. Middle part of each panel has been exposed to 50% H_2SO_4 for 1 day. Lower part of each panel has been subjected to an impact resistance of 172 inch pounds. Relative comparisons are shown.

Aluminum foil and collapsible tubes coated with a tough, hard, white enamel based on polyamide-epoxy resin (1:1). The foil and tubes have been crumpled excessively, yet the coating adheres excellently and is broken only where the substrate is broken as shown in the above photo.



Salt spray resistance of polyamide resin-epoxy resin films after 400 hrs. in salt spray cabinet. 1A - 100/1001 (1:1) air dried; 1B - 100/1001 (1:1) baked; 2A - 115/1001 (35:65) air-dried; 2B - 115/1001 (35:65) baked; 4A - 115/1001 (1:1) air-dried; 4B - 115/1001 (1:1) baked.

100 - Polyamide Resin 100
115 - Polyamide Resin 115
1001 - Epon Resin 1001

duced storage temperature increase solution stability.

Curing Time

Films containing from 30 to 70 percent of Polyamide Resin 100 and the balance epoxy resin will cure completely within 48 to 72 hours at 80°F., within 2 hours at 140°F., 30 minutes at 200°F. and 10 minutes at 300°F. Adhesive formulations and coatings containing 80 parts or more of Polyamide Resin 100 require somewhat longer curing times to attain maximum properties.

A baking treatment is required to develop optimum properties (especially full adhesion) but for many types of service, curing at room temperature is adequate.

Suggested Uses

Polyamide Resin 100-epoxy resin combinations are generally applied from solution. Suggested use and applications are described below. In applications where solvents cannot be tolerated, Polyamide Resin 115 in combination with fluid epoxy resins is more useful. Polyamide Resin 115 is similar to Polyamide Resin 100 but less viscous and more reactive. Blends with epoxy resins can be prepared without the use of solvents. Polyamide Resin 115 is described in detail in General Mills' Technical Bulletin Series 11-6.

Metal and Wood Coatings: Clear and pigmented finishes for metal and wood may be readily formulated from Polyamide Resin 100-epoxy resin combinations. These finishes have excellent adhesion to many surfaces and possess exceptional gloss, flexibility, hardness, abrasion, and impact resistance.

Finishes for brush and spray applications are formulated into two solutions just prior to use. Spray formulations and properties are shown in Table I.

Paints may be prepared by grinding the pigments into either a mixture of crushed epoxy resins and solvents or into a Polyamide Resin 100 solution. Either a pebble or a 3-roll mill may be used with the Polyamide Resin 100 solutions. A pebble mill is recommended when the pigments are ground into the epoxy resin solutions.

In the white formulations listed in Table I, replacement of 20% of the titanium dioxide with certain acicular zinc oxides such as XX601 (N. J. Zinc) has been found to improve whiteness somewhat. In baking applications clean, fume-free ovens are necessary to obtain the best color.

When these finishes are cured at room temperature, they can be handled within 1 or 2 hours. Maximum values of hardness, flexibility, impact and chemical resistance are reached after about 4 to 7 days at which time the

finishes approach baked coatings in properties. In every case the impact resistance and adhesion of baked coatings are superior to the same coatings air-dried.

Traces of silicones* may be added to coating formulations to prevent floating, silking, or formulation of hairline patterns on the surface of the thick films. They should be used with great care, however, since an excess has occasionally been found to cause cratering and crawling. It has been found that certain urea resins such as Beetle 216-8 or 227-8 (American Cyanamid) are often effective in overcoming this tendency.

For a brushing vehicle, Polyamide Resin 100 may be dissolved in a 9:1 mixture of Enjay[5] 150 solvent or its equivalent and Cellosolve. The Epon 1001 may be dissolved in equal parts of Enjay 150 and Cellosolve. The two solutions are combined just prior to use. A suitable thinner consists of a 9:1 mixture of Enjay 150 and Cellosolve. The blends will tolerate only small amounts of mineral spirits. This vehicle has also shown promise in silk screen processing.

The properties of Polyamide Resin 100-Epon 1001 air-dried coatings in comparison to ethylene diamine cured Epon coatings are presented in Table III.

Paper Coatings: Coatings for printed paper may be formulated from Polyamide Resin 100-epoxy resin compositions. Table III gives recommended formulations and properties of the coated paper. General Mills' Technical Bulletin Series 11-7 describes these coatings in detail.

Coatings for Rubber: Polyamide Resin 100 (80 parts) and Epon 834 (20 parts) when applied from solution and cured give highly flexible, glossy coatings which protect the rubber. Another useful formulation consists of 90 parts Polyamide Resin 100 and 10 parts of Epon 1001. Curing at 100°F. overnight is recommended although the coatings will be hard enough to handle after 3 or 4 hours.

Coating for Plastics: Polyamide Resin 100-Epon 1001 blends (1:1) adhere very well to many plastics and provide useful high gloss coatings. Their toughness and resistance to chemical attack will improve the characteristics of many plastic films and molded articles.

Specifically, these coatings may be used on the following plastics with good results: polyesters, polystyrene,

(*Turn to page 128*)

*Dow-Corning DC 200 Silicone Oil, Linde's X12 Silicone or G.E.'s SF96 Silicone.

5. Enjay Co., Inc.

General Mills Polyamide Resin 100-Epoxy Resin Paper Coating for Varnishing*

Coating Compositions and Properties	Parts by Weight	Coating Compositions and Properties	Parts by Weight
SOLUTION A		**SOLUTION E****	
Polyamide Resin 100 Solution A (60% N V in 1:1 ratio of toluene-isopropyl alcohol)	100	Epon Resin 1001	56
THINNER***	Varnish Coater	Vinylite VAGH Resin	28
Xylene	216	Toluene	44
Cellosolve	24	Methyl ethyl ketone	44
		Isopropyl alcohol	28

TYPICAL APPLICATIONS	Varnish Coater
Percent solids	20-30
Coating weight (lbs./100 sq. ft.)	0.50-2.0
Possible mileage****(per gallon undiluted solution – 48% solids)	Approx. 700,000 sq. in.
Coating speed	2600 sheets/hr.
Drying temperature, °F. (min.)	150-250
Drying space (feet of heated oven)	20-45
Taber abrasion 40 cycles CS 8 wheel 1000 g. wt. (grs. loss)	....
Gloss 60° Reflectometer	85
Flexibility	Excellent
% blocking (2 lbs./sq. in./120° F/100% RH for 24 hrs.)	0

*Rotogravure formulations vary with the specific equipment to be used. Those interested in rotogravure coating are requested to contact General Mills for technical information and recommended formulations.

**Unless otherwise specified, 0.1% 4-methyl 7-diethylamino coumarin (M.D.A.C., Carlisle Chemical Works, Inc.) is added to all paper coating compositions to increase the effectiveness over light colored areas, and 0.1% Dow DC-200 oil is added to improve slip characteristics.

***If more rapid dry is needed, a thinner consisting of 120 parts toluene, 60 parts isopropyl alcohol, and 60 parts methyl ethyl ketone may be used.

****Mileage depends to a large extent on the paper stock used. This mileage figure is for 60 pound litho coated one side.

Table III

Table IV

COMPARISON OF AIR-DRIED COATINGS

	Epoxy Resin: Ethylene Diamine (100:6)	PA 100: Epon 1001 (50:50)	PA 115: Epon 1001 (50:50)
Dry Tack-Free	130 Min.	65 Min.	80 Min.
Initial Gloss of White Enamel	90	102	102
Gloss After 300 Hours in Weather-Ometer	65	93	81
Gloss After 500 Hours in Weather-Ometer	5	36	30
Initial Light Reflection (Hunter-Green Filter)	77.0	77.4	76.4
Yellowness—Initial (Hunter (A-B ÷ G)	1.4	3.6	2.1
After 300 Hours in Weather-Ometer	11.8	9.4	10.2
Chalking After 3,000 Hours in Weather-Ometer	Heavy	Medium	Medium
Boiling Water 30 Minutes:			
Immediate	Softened	Softened	Hard
1 Hour Later	Blushed	Blushed	O.K.
20% NaOH—1 Day	Hard	Hard	Slightly Soft
50% H_2SO_4—1 Day	Hard	Hard	Soft
Sward Hardness:			
1 Day	28	24	26
1 Week	42	48	50
1 Month	47	50	50
Impact Resistance (inch-pounds)			
Tin Plates:			
1 Day	30+	2	30+
1 Week	30+	30+	30+

HARD SYNTHETICS

Included in this class are maleics, modified phenolics, pure phenolics, and copal type synthetics—all of which can provide a range of properties to meet many requirements

By
William Manko*


William Manko

TODAY'S organic coatings are constantly demanding new compositions which yield more rapidly drying varnishes, tougher and longer lasting films. Industry is engaged in a continuous search for the perfect resin. An ideal resin for coating compositions must not only possess all of the desirable physical properties of a film-forming material but must also be economical in its use and production.

Due to the complexity of our present demands for durable and economic coatings, various types of hard synthetic resins today have almost completely replaced the use of natural copal gums in the paint and varnish industry. As a result, the finish on our present-day automobiles, for example, differs enormously from the coatings applied to the first cars when the automotive industry was in its infancy. To keep pace with the unceasing requirements of the paint and varnish industry for more resistant and less costly coatings, the synthetic resin industry in the past several years has developed several general classes of hard resins. They are known as maleics, modified phenolics, pure phenolics and copal type synthetics. There are also various modifications of each of the three general types which results in the availability of a resin for practically any coating problem. The constant improvement in the quality of the basic raw materials for resin production manifests itself in the manufacture of resins of uniform composition and lighter colors.

Maleics

Maleic-modified rosin resins are used to a great extent in varnishes as well as in printing inks and nitrocellulose lacquers. These resins are available in a wide range of properties depending upon the ratio of maleic to rosin and the type and quantity of alcohol used for esterification. Since the rosin-maleic adduct is a tribasic acid it readily forms insoluble products with a trihydric alcohol such as glycerine. This adduct possesses three carboxyl groups: one from the rosin and two from the maleic anhydride. As a result, it is trifunctional and its configuration in space is three-dimensional. This enables it to enter in to three-dimensional cross-linking with a polyfunctional alcohol such as glycerine to produce an insoluble product. Controlled solubility can be achieved simply by using less than the molar ratio of rosin and maleic anhydride. The percentages of maleic used usually range from 3% to 15%, depending upon the hardness and solubility desired and the type of rosin used. The various types of polymerized rosins available today considerably increases the number of maleic-modified rosin combinations. If an increased hardness or reactivity with oil is desired, it can be obtained by using a more complex alcohol for esterification, such as sorbitol or pentaerythritol. In this way the class of varnish maleics is built up, yielding individual resins, varying in acidity from 10-40, in melting point from 120-155°C., in viscosity from F to Z, and in solubility from types which are completely soluble in aliphatic hydrocarbons, to those which are soluble only in aromatic hydrocarbons. Accordingly, the solubility in oils varies within wide limits, some types dissolving in bodied oils at very low temperatures, and others going into solution only at the high temperature of more than 550°F. They are also distinguished by a high degree of paleness and color stability, which withstand baking temperatures to a remarkable extent.

In varnish cooking, maleics show little reactivity with oils and body comparatively slowly. On storage the maleic varnishes have a tendency to gain viscosity, which may lead to gel formation. Maleic varnishes dry satisfactorily when freshly made, but show a decided loss in drying speed on storage, due to the formation of insoluble drier complexes. This deficiency is not very noticeable in varnishes of an oil length shorter than 10 gallons, and is negligible in all baking finishes. Varnishes made with high melting maleics possess good hardness of the dried film, even when soft oils are used. The water and alkali resistance of maleic varnish films is low, in accordance with the pronounced saponifiability of the resins. The best suggested uses of maleic varnish resins are interior finishes and low-cost industrial finishes.

Modified Phenolics

Rosin-modified phenolic resins are available in a rather wide range of color grades, hardness and solubility. These are possible by varying the

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ratio of phenol condensate to rosin, varying the type of phenol and formaldehyde ratio in the condensate, and varying the degree of esterification and type of alcohol. Another possibility for variation consists in using gum rosin, wood rosin or polymerized rosin. Other changes can be made by the incorporation of maleic or fumaric compounds. The most important factor in producing rosin-modified phenolics is the amount and type of phenol formaldehyde condensate used. Practically only the alkali-condensed, and not the acid-catalyzed, phenolic bodies are employed for this purpose, the principal phenols being the para substituted types of the tertiary butyl and amyl phenol and the bis phenol.

Rosin-modified alkyl phenol resins are characterized by excellent solubility even if the resin has high melting point and viscosity. They are completely soluble in mineral spirits, and dissolve rapidly in all oils. Such resins possess good oil reactivity and are ideal material for combination with china wood oil or oiticicia oil. The drying characteristics of these resins are ideal for hard oils but their drying accelerating effect, as a rule, is too weak for soft oils.

Rosin-modified bis phenol resins are of great importance. They possess grades of medium color, melting points of 145-175°C and viscosities ranging from U to Z-7. These resins have satisfactory color stability to make them suitable for use in enamels of all colors except white and very light tints. Their relatively low acidity makes them safe with most pigments including zinc oxide, provided at least 50% of the oil used is linseed oil. The high melting points of the hard grade modified bis phenol resins produce hard and abrasion-resistant films. In spite of their high melting points and viscosities, these resins have sufficient solubility to insure reliable stability of the varnishes on storage. Since this type of resin is difficult to saponify, their varnish films exhibit high water and alkali resistance.

Cooking procedures are rather simple. A top heat of 580-590°F should be applied. If low viscosity oils are used, the resin, with all of the oil, is heated together; if heavy oils are used, the cooking must be done in steps. These resins should never be used as chillbacks since they do not possess the solubilities characteristic of the rosin-modified alkyl phenol resins. Varnishes based on soft oils require small additions of hard oils and the total oil length should not be greater than 35 gallons. The usual drier recommendations for varnishes based on these resins 0.1% cobalt and 1% lead calculated on the oil.

Non-esterified phenolics exceed normal phenolics in their drying speed to a remarkable extent, and in their power to cause through-hardening of the film. The accelerated drying effect is particularly great on linseed oil and somewhat less pronounced on dehydrated castor oil. The constants on these resins are similar to those of the esterified types with the exception of acidity. It usually ranges between 100 and 130 which somewhat restricts the pigmentation of varnishes with them. Their phenol content is very high and usually some after-yellowing occurs in the dried varnish film. The types of phenols in these resins range from USP phenol to bis phenol. However, bis phenol is predominently used.

In making varnishes with this type of resins, low viscosity oils should be used and in case of varnishes of more than 15 gallons oil length, the resin is heated with part of the oil first and further additions are made in steps, reheating each time to top heat. These resins are ideal for straight china wood oil, and oiticicia oil varnishes, because their high acidity prevents gelation and allows complete gasproofing. Water resistance of these varnishes is good. This class of rosin-modified phenolics is distinguished by an unusually high tolerance for alcohol. Members of this family of resins find useful application in abrasive finishes and rubbing varnishes.

Pure Phenolics

100% phenolics of the oil-soluble type are based on substituted phenols, namely, p-tert-amylphenol, p-tert-butyl phenol, p-cyclohexyl phenol and p-phenyl phenol. Resins based on p-tert-amyl phenol and p-cyclohexylphenol are somewhat slower bodying and slower drying than those based on either p-tert-butyl phenol or p-phenyl phenol.

Two basic types of resins result from condensing the above-mentioned phenols with formaldehyde: the heat-reactive type and the non-heat-reactive type. The type is governed by the ratio of formaldehyde to phenol and whether an acid or an alkaline catalyst is used. Generally, acid catalyzed resins are non-heat-reactive and the alkaline catalyzed resins are heat-reactive in nature.

The melting points of pure phenolic resins range from 85-160°C. The resins have an opalescent appearance but yield clear and pale varnishes possessing good color retention. The high melting acid-condensed types are soluble in aliphatic hydrocarbons. They combine with oils without foaming. When linseed oil is used, the unbodied oil should be used and the resin should be heated with all of the oil, to 580°F, and held there until the desired viscosity is obtained. Checking with linseed oil must be avoided since it impairs the drying.

In wood oil containing varnishes, the wood oil is to be added as a chill-back after the resin and the other oils are combined. The bodying of such wood oil varnishes should be carried out at 480°F to quickly make them gasproof and decrease their tendency to skin.

These acid-condensed high melting resins produce excellent zinc chromate and other pigmented primers, and create finishes that are outstanding for their water, alkali and chemical resistance. The relatively low melting acid-condensed p-phenyl phenol resin is characterized by its speed of dry in both short and long oil varnishes. Not only does this type of resin yield rapid drying varnishes but it also yields varnishes of high chemical and water resistance. Such resistance can even be increased by varying the method of cooking slightly.

Acid-condensed p-tert-amyl phenol resins are characterized by unusually high solubility and compatibility. They have relatively low melting points (85-100°C) and are soluble in petroleum ether, mineral spirits, or kerosene and also in alcohol. These types of resins are ideal material for cold cuts, designed to improve the water resistance of alkyd resin solutions, lacquers or spirit varnishes. They produce water, alkali and chemical resistance in the dried films, and impart to them pronounced elasticity.

Alkali-condensed alkyl phenol resins vary in melting point, as a rule, between 75 and 100°C. Their initial color is extremely pale and they keep their color in the dried varnish film much better than resins from aromatic substituted phenols. These resins are mildly heat reactive and their melting points increase when they are heated alone. When heated with soft resins, like estergum, they increase the melting point of such resins considerably. When heated with soft oils, such as linseed oil, they increase the viscosity of such oils substantially, which is an important factor for practical varnish cooking. It requires very careful handling because it is accompanied by more than the usual foaming. The best method is to bring the oil up to 350°F, add the resin slowly, stirring until it is completely dissolved, and heat to 425°F, holding the temperature until the foam has subsided. After the foam has disappeared the batch can be heat-bodied at about 480°F in the usual fashion. During the foaming period the resin loss is approximately 5% by weight. The resins impart high water and alkali resistance even to varnishes of long oil lengths, and

(*Turn to page 134*)

HYDROCARBON AND COUMARONE-INDENE RESINS

Alone or in conjunction with other vehicles, these low cost resins have a variety of applications: aluminum vehicles, bronzing liquids, shipbottom paints, can lining, etc.

By

William Craig*

William Craig

COUMARONE-INDENE resins were one of the first synthetic resins introduced to the varnish industry, having been first produced in Germany as early as 1900. They are derived from coal-tar naphthas obtained as a by-product in the coking of bituminous coal. The composition of these resins is essentially coumarone and indene; and they are polymerized either catalytically or thermally under controlled conditions of concentration, catalyst, temperature, and pressure to yield resins of different average molecular size depending on melting point desired.

Properties of Resins

Resins quite similar in properties to the coumarone-indene type are produced from unsaturates of petroleum origin by similar processing techniques. Still other varieties of hydrocarbon resins from these sources possess heat reactive qualities and yield oleo-resinous varnishes, which set and dry quickly, have good reagent resistance, and yellow only slightly on exposure to sunlight. LX-685 is an example of this type of resin.

The melting points regularly produced cover a wide range, from soft plastic polymers with an approximate melting point of 5° C. (R&B) up through a very hard, brittle variety (Nevindene) possessing a melt point of 126° C. min. An extremely high melt point 155° C. min. can also be obtained with a resin like LX-509. A wide color range is commercially available from very pale amber to dark brown. Excellent resistance to temperatures up to 600° F. are inherent in these resins. Additional properties are included in the following table.

Physical Properties of Varnish Grades Coumarone Indene Resins

Specific Gravity @ 15.6/15.6° C.	1.100 - 1.145
Pounds per gallon @ 15.6° C.	9.17 - 9.55
Flash Point	above 250° C.
Refractive Index @ 25° C.	1.62 - 1.65
Molecular Weight (Weight Average)	480 - 775
Acid Number	below 2
Saponification Number	0
Iodine Number (average)	30-60
Ash (maximum)	0.1%

A group of phenol-modified coumarone-indene resins is also available (Nevillac), which—unlike coumarone-indene themselves—are soluble in both the lower molecular weight alcohols and aromatic solvents, and possess a wider degree of compatibility with other film forming materials. This group of resins is compatible with most of the commonly used drying oils as well as the following:

- Abalyn
- Alkyd Resins and Modifications
- Asphalt
- Benzyl Cellulose
- Castor Oil
- Cellulose Acetate
- Cellulose Nitrate
- Chlorinated Paraffin
- Coumarone-indene Resins
- Ethylene Glycol
- Ester Gum
- Ethyl Cellulose
- Hercolyn
- Hydrogenated Naphthalene

Properties of Coatings

Coumarone-indene resins are useful in coatings where resistance to alkalis, weak acids, brine, and the elements is needed. The inclusion of these resins in oleo-resinous varnishes give the varnish additional valuable properties such as quick through-drying, abrasion resistance, water-proofness, corrosion resistance, good electrical insulation strength, and excellent adhesion. Properly prepared coumarone-indene resin varnishes blend well with other varnishes, and the extremely low acid number of such varnishes makes them ideally suited for use in conjunction with reactive basic pigments, color lakes or toners.

Freedom from polar materials, such as the low molecular weight acids, inorganic alkalis, ketones, aldehydes and alcohols, plus high surface tension characteristics, make coumarone-indene resins one of the most widely used products for the flooding and floating of aluminum pigments. The excellent degree of leafing exhibited initially is retained in ready mixed coumarone-indene based aluminum paints after long storage intervals.

Formulating Techniques

Coumarone-indene resins lend themselves to a wide variety of processing techniques. In the case of cooked oleo-resinous varnishes where soft oils such as linseed, soya bean or fish oils are involved, these should be pre-bodied

(Turn to page 115)

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SILICONES

Straight and modified types show application in the formulation of heat-, weather-, and corrosion-resistant finishes

By
R. C. Hedlund*

THE TREND toward higher operating temperatures has created many uses for silicone resins in industrial coatings. During the past ten years, silicone resins and modified silicone resins have been developed which offer the paint formulator new possibilities of heat, weather and corrosion resistance.

R. C. Hedlund

The improved heat stability of silicone resins over conventional organic resins is due to their basic inorganic structure. The silicon-oxygen structure is extremely stable to heat, oxidation and weathering. To obtain flexibility and improved solvent solubility, this silicon-oxygen molecule is modified with organic groups, i.e. methyl, ethyl and phenyl. A typical silicone resin is made from three or more monomer units having various functionalities. A general formula might be that given in Fig. 1. The flexibility, heat stability and hardness of the resin depend upon the type of R group and the proportions of each monomer.

Most of the commercially available silicone resins are stable for long periods of time at 400°F, or approximately 100 Fahrenheit degrees above the practical operating temperatures for organic vehicles. Above 400°F, the composition of the resin becomes more significant and care must be exercised in selecting the most suitable resin.

Protective coatings made from silicone resins have many outstanding properties, such as:

1. heat resistance above 400°F
2. color retention up to 500°F
3. gloss retention up to 500°F
4. weathering and salt spray resistance
5. good flexibility and hardness
6. adhesion to aluminum and tin surfaces.

Table I illustrates the wide range of properties available with typical silicone resins that have been developed by *Dow Corning Corporation.*

Disadvantages of silicone protective coatings are:

1. the high curing temperature required
2. low abrasion and mar resistance
3. fair adhesion properties to steel
4. high cost

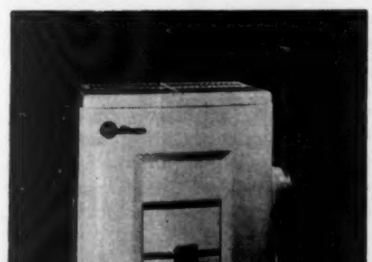
These disadvantages are gradually being overcome with the development of new, improved resins.

Vehicles Used

Three types of vehicles are used in formulating silicone finishes. (1) Silicone resins are used alone for maximum heat resistance. (2) Small amounts of organic resins are added to the silicone to give improved physical properties but with a loss in heat stability. (3) Small amounts of silicone resins are added to organic resins to upgrade heat and weather resistance.

$$\left[\begin{array}{c} R' \\ | \\ R-Si-O- \\ | \\ R \end{array}\right]_x \left[\begin{array}{c} R \\ | \\ -Si-O- \\ | \\ O \end{array}\right]_y \left[\begin{array}{c} R' \\ | \\ -Si-O- \\ | \\ R \end{array}\right]_z$$

Figure 1. General chemical formula.



The platinum modified silicone finish on the grills of this space heater was tested for 500 hours at 450°F. without showing discoloration, checking or powdering. The finish has a pencil hardness of better than 5H; yet will take a 180-degree bend on 20 gauge steel over an 1/8 inch mandrel and will also withstand a concave impact test of some 30 inch-pounds.

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Some of the organic resins which have proven useful in combination with silicone resins are: acrylics to improve air-drying; melamine resins to give improved hardness and mar resistance; and coumarone, chlorinated diphenyl and ester gum resins to lower the cost in aluminum vehicles. By careful selection of these and other organic resins, excellent protective coatings can be formulated for high temperature industrial applications.

Special silicone resins have been developed which are more compatibile with organic vehicles than the standard heat resistant resins. Resins such as Dow Corning 840 have found numerous uses at concentrations as low as one percent. However, to show any great improvement in heat and weather stability at least 10 to 25 percent silicone is necessary. For improved color stability in the temperature range of 350° to 400°F, at least 50 percent silicone is usually required in white and off white colors. Because of its low surface tension properties, Dow Corning 840 has found use as a flow control agent in many resins including alkyds and epoxys. Water resistance can be improved by addition of small amounts of compatibile silicone resins to polyesters, phenolic basing cements and many varnishes.

Formulation

In formulating silicone finishes, conventional paint milling equipment can be used. Grinding of pigments is generally easier than with most organic resins. Care must be exercised in choice of pigments for heat stable applications. Some pigments which are satisfactory are: (1) unmodified titanium dioxide, (2) iron oxide, (3) carbon black and graphite, (4) cadmium yellows and reds, (5) chrome oxide, (6) lead free zinc oxide, and (7) extenders such as magnesium silicate, diatomaceous earth, aluminum silicate and mica. In all formulations lead containing pigments must be avoided, as rapid gelling will occur.

Metal driers are often used to increase the drying rate of silicone paints. Zinc and cobalt are most often used because of their good shelf life properties. Lead, iron, tin and calcium can be added just prior to application if a very fast cure is required, but shelf life is limited. In the faster curing resins, such as Dow Corning 803 and 840, no drier is required.

Mixtures of mineral spirits and aromatic solvents or ketones can be used with the silicone resins. In general, a kauri-butanol value greater than 60 is satisfactory.

Physical Properties

Resin	N.V.M.	Solvent	Thinner	Viscosity, centipoises
805	50	Xylene	Aromatic	80-125
806	60	Toluene	Aromatic	100-200
804	60	Toluene	Aromatic	20-40
840	60	Toluene	Aromatic	15-25

Baking Properties

Resin	Air-dry	Cure	Flexibility	Pencil Hardness	Abrasion Resistance
805	Tacky	1 hour-480°F	Excellent	F	Poor
806	Tack-free	1 hour-450°F	Fair	H	Poor-fair
804	Tack-free	1 hour-450°F	Poor	2H	Fair
840	Tack-free	1 hour-450°F	Fair	H	Fair

Aging Properties

Resin	Heat Resistance	500°F Gloss Retention	500°F Color Retention	5 year Weather Resistance	300 hour Salt Spray Resistance
805	8000 hours-480°F	Fair	Excellent	Excellent	V. Good
806	5000 hours-480°F	Excellent	Excellent	Good	V. Good
804	300 hours-480°F	Excellent	Excellent	Poor	V. Good
840	500 hours-480°F	Good	Excellent	Good*	Good

*Exposure incomplete, estimated from data on other resins

Table I. Range of properties available with silicone resins.

Physical Properties

Resin	N.V.M.	Solvent	Thinner	Viscosity, centipoises
R-856	50	Xylene-MIBK	Xylene-MIBK	100-200
R-862	60	Xylene	Xylene	100-200
R-878	50	Mineral spirits and xylene	Mineral spirits and xylene	300-800

Baking Properties

Resin	Air-dry	Cure	Flexibility	Pencil Hardness	Adhesion Steel
R-856	Tack-free	1 hour-400°F	Good	2H	Excellent
R-862	Tacky	1 hour-350°F	Good	2H	Excellent
R-878	Air-dry (with metal drier)		Excellent	HB	Excellent

Aging Properties

Resin	400°F Gloss Retention	400°F Color Retention	Lacquer Compatability	Alkyd Compatability	Weathering Resistance
R-856	Excellent	Excellent	Poor	Poor	Fair
R-862	Poor	Fair	Excellent	Good	Good
R-878	Fair	V. Poor	Slight	Good	Excellent

Table II. Properties of three typical silicone-alkyds.

Modified silicone resin based finish, used on the manifold, readily withstands the exceedingly high temperatures generated by exhaust gases. It provides greater protection and maintains better appearance. In acceptance tests, finish coated panels were cycled 8 hours at 1000 deg. F. and 16 hours at room temperature for 5 days without any blistering or peeling.

Uses

The main uses of silicone based paints have been in heat resistant applications such as stack and muffler coatings, space heaters and other similar heating devices, incinerators, aircraft engine coatings, heat resistant marking inks, and glass and lamp bulb coatings. Increased interest in other properties of silicone resins, such as water and weather resistance, undoubtedly will lead to still other applications for protective coatings based on silicone resins.

Modified Silicone Resins

In many applications silicone vehicles cannot be used because of limited curing facilities. In some cases cold blending of silicones with organic resins gives satisfactory finishes, but in others it appears that a chemical combination of silicones with organic resins is necessary. Basic research on various chemical combinations has shown that silicone-alkyds could be made which exhibited improved color retention over conventional alkyds with good adhesion and lower curing cycles than the silicone resins.

Because the silicone content of the silicone-alkyd resins can be varied, they may be designed to do many specific coating jobs. Resins with a low silicone content behave much like alkyds, but have superior film integrity when heated. Resins with a high silicone content have excellent gloss and color retention at temperatures up to 400°F. In air-drying formulations, where drying oils are used, the silicone-alkyds have excellent weathering properties and are very chalk resistant. The properties of three typical silicone-alkyds are given in table II.

Range of Properties

The data show that a wide range of resins can be produced which have properties between those of the alkyd and silicone resins. The R-856 Resin is designed for heat resistant applications where improved physical properties are required. The R-862 Resin is a nondrying type for use in baking finishes and in nitrocellulose lacquers. The R-878 Resin can be used in air-drying maintenance and trim paints, and in combination with urea and melamine resins for low bake enamels for exterior use.

Maintenance finishes formulated with the silicone-alkyd vehicles have been exposed under severe chemical plant conditions for over 2 years with excellent results. Coatings on stacks at temperatures of 400°F, water towers and distillation towers show excellent color retention and corrosion protection.

Formulation procedures for the silicone-alkyds are similar to those for organic vehicles. Conventional solvents and pigments can be used in standard grinding equipment. Recommended driers for the air-drying type resins are combinations of cobalt, manganese, calcium and lead ocoates or naphthenates.

Many other combinations of silicones with organic vehicles are being investigated. Because it is a new field of vehicle formulation, improvement will continue in both heat durability and weathering resistance. It is expected that much wider use will be made of the air-dry type resins in maintenance paints, automotive finishes and similar applications where weather durability is of the utmost importance.

Garbage Incinerator Covers: Cover at left shows how badly conventional white baking enamels deteriorate after a few weeks of service at temperatures of 500 deg. Fahrenheit. After comparable periods of service, there is no apparent deterioration of the original whiteness and gloss on the cover at the right, coated with a specially formulated modified-silicone finish.

VINYLS

These resins offer a combination of properties for formulating primers and finishes having good toughness and adhesion, moisture-, salt spray-, chemical-, and solvent-resistance

By

W. H. McKnight*

W. H. McKnight

VINYL resins for surface coatings present a unique combination of properties which make them particularly adaptable for many applications. Coatings based on Bakelite vinyl chloride-acetate resins are easily applied by spraying, roll-coating, dipping, or brushing. These finishes have excellent toughness and flexibility. Metal sheets coated with a properly formulated and applied vinyl resin coating can be drawn, spun, crimped, or otherwise fabricated without loss of adhesion and without marring or cracking the finish. These resins are characterized by extreme chemical inertness. Properly formulated films are not attacked at normal temperatures by practically any strength of alkalies or mineral acids. They are completely insoluble in alcohols. Greases, oils, and aliphatic hydrocarbons do not dissolve them. They dissolve only in organic liquids such as ketones, esters, chlorinated hydrocarbons, and certain special solvents.

Some of the more important vinyl resin-based formulations, together with their properties and recommended uses, are included in this article. These vinyl resin-based coatings have been classified as:

(1) primers,

(2) intermediate or finish coats.

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Primers

Baking Primers

The most widely used general-purpose baking primers in the vinyl solution coatings field are the blue lead-resin VYHH primers. These primers can be formulated to give films with varying degrees of flexibility. Two examples of such formulations are represented by the following:

Basic blue lead sulfate	29.0	31.3
Bakelite vinyl resin VYHH	11.9	13.0
Flexol plasticizer DOP	2.2	3.4
Thinner Mixture*	56.9	52.3
Parts by weight	100.0	100.0

*40 per cent methyl isobutyl ketone
10 per cent ethyl butyl ketone
40 per cent toluene
10 per cent xylene

The above primers, as with most high gloss (or high-quality-type) vinyl coatings, are prepared by dispersing the pigment in a portion of the resin and plasticizer on a two-roll rubber-type mill or the equivalent. The "stock" or "chips" obtained are dissolved in solvent to form a paste which is then cut back with the balance of the vinyl resin solution to adjust the pigment-vehicle ratio. These primers require baking for ½ hour at 350 to 375 deg. F. to develop their excellent adhesion to smooth, clean steel. Either air-dry or baked finishes based on any of the vinyl chloride-vinyl acetate copolymer resins can be applied over these primers.

The proportion of stabilizing pigment can be decreased, and film strength and impermeability correspondingly increased, for use where milder baking conditions suffice, or where the type surface is sufficiently neutral in accelerating thermal degradation of the resin. Thus, over light gage tin plate, terne plate, or phosphate-treated steel the pigment/resin ratio can be lowered to 20 to 25/15, and baking time can be 15 to 20 minutes at 350 to 375 deg. F.

Since the dark color of the blue lead primer is sometimes difficult to mask, a light-colored primer of practically the same quality can be formulated as follows:

	XE-703
Basic white lead sulfate	15.8
Titanium dioxide rutile	6.6
Antimony oxide	0.7
Bakelite vinyl resin VYHH	14.7
Flexol plasticizer DOP	5.0
Thinner mixture*	57.2
Parts by weight	100.0

*40 per cent methyl isobutyl ketone
10 per cent ethyl butyl ketone
40 per cent toluene
10 per cent xylene

This primer is handled in the same manner as the two above. It should be baked for ½ hour at 350 to 365 deg. F. for best results.

Wash Primer

For complete air-dry systems, the metal conditioner or wash-coat type primers based on vinyl butyral resin XYHL give the best adhesion and general performance over clean, smooth steel in all laboratory tests. The three vinyl butyral resin primer formulas most generally recommended are given in Table I.

The base grinds (Table I) are prepared in a pebble mill using flint pebbles, to avoid iron contamination. The Government Specification MIL-C-15328-A base grind must be mixed with acid diluent just before use. This formulation deteriorates rapidly and approximately eight hours after mixing, the coating has very poor ad

hesion to metal. The other two base grinds may be mixed with acid diluent immediately and stored for at least one year without evidence of deterioration.

All of these primers show excellent performance, but there are some preferences for certain uses. WP-1 is the best overall metal conditioner for all types of metals, and for all service involving salt water exposure. The XE-5220 formulation should be used only on steel, and has shown excellent durability in industrial maintenance painting, especially when used with an aluminum pigmented vinyl resin VAGH topcoat. Although this type of coating will give satisfactory service when exposed to salt water, it is usually recommended for fresh water applications. In addition, XE-5220 films are not heat-stable at temperatures above 250 deg. F.

Formula Suggestion XE-5298 is a comparatively new formulation, which is recommended for application on steel. This one-package wash primer shows no evidence of loss of ability to adhere after up to one year of storage.

All wash primers can, of course, be used with many non-vinyl topcoats such as phenolics, alkyds, and oleoresinous paints, and will notably increase the adhesion and durability of these coatings. Of the vinyl solution coatings tested to date, only finishes based on Bakelite vinyl resin VAGH adhere to wash primers.

Base Grind	MIL-C-15328-A (WP-1)		XE-5220		XE-5298	
Bakelite vinyl resin XYHL	7.2		9.0		9.0	
Basic zinc chromate (low water solubility)	6.9		—		—	
Lead chromate[1]	—		8.6		—	
Chromic phosphate[2]	—		—		9.0	
Talc[3]	1.1		1.4		1.4	
Lampblack	Trace		—		—	
Isopropanol (99 per cent)	48.7		53.0		54.5	
N-butyl alcohol	16.1		—		—	
Methyl isobutyl ketone	—		13.0		16.1	
		80.0		85.0		90.0
Acid Diluent						
Phosphoric acid (85 per cent)	3.6		2.9		1.8	
Water	3.2		2.9		1.8	
Isopropanol (99 per cent)	13.2		9.2		6.4	
		20.0		15.0		10.0
		100.0		100.0		100.0

(1) Such as "Imperial" A-548, Imperial Paper & Color Co., Glens Falls, N. Y.
(2) Such as du Pont G-727-D, E. I. du Pont de Nemours and Co., Wilmington, Del.
(3) Such as "Asbestine" 3X, International Talc 90 West St., New York, N. Y.

Table I. Three vinyl butyral resin formulations.

Low-Temperature Baking Primer

Another type of air-dry and low temperature baking primer is based upon vinyl resin VMCH. This resin is much like vinyl resin VYHH except that it contains a small proportion of strong polar groups (carboxyls) which enable it to bond tightly to clean metal and many other surfaces. Baking is not required for adhesion, but a forced-dry at temperatures up to 250 deg. F. is often used in industrial applications to speed release of solvents. Thus, since high temperature bakes are not needed, the stabilizing pigments required for the vinyl resin VYHH primers can be omitted. This is of especial interest in many metal decorating formulations.

Since vinyl resin VMCH depends for its good air-dry adhesion upon its un-neutralized carboxyl groups, care must be used to assure that these remain un-neutralized during preparation and storage. Pebble mills, using flint or ceramic pebbles, are suggested for the preparation of vinyl resin VMCH solution coatings. Containers should be tin lined or have a baked phenolic lining; the use of plain iron or steel equipment for preparing or storing solutions based on vinyl resin VMCH is not recommended. Furthermore, the inclusion of 0.1 to 0.3 per cent of propylene oxide in all solutions is a worth-while precaution. Other stabilizers may react with the carboxyl groups or otherwise interfere with adhesion, and should be selected only after careful trial. Other vinyl chloride-acetate resins can be used with vinyl resin VMCH without adverse effect on adhesion. This blending limit depends to some extent upon the specific formulation and use, but is often at least 50 per cent of the other resin, such as vinyl resin VYHH. This makes it convenient to use pigments dispersed in vinyl resin VYHH. This is the preferred practice for pigmenting VMCH coatings, because resin VMCH tends to exhibit some reactivity with certain of the more basic pigments, leading to gelation and loss of adhesion. In these cases, such as finishes containing the lead and zinc pigments, it is often desirable to use a two-package formulation, keeping the VYHH resin pigment dispersion and the VMCH resin solution apart until just before use.

In some instances, however, it is desirable to take advantage of the reactivity of vinyl resin VMCH with lead pigments to prepare baking primers which develop much improved resistance to solvents or plasticizers included in topcoats. A blue basic lead sulfate pigmented VMCH resin coating is handled as a two package system to forestall premature reaction and gelation. Many pigments, such as titanium dioxide, certain iron oxides, various inerts, and chromic phosphate show no reactivity and can be used in primer and finish coat formulations without any complications.

Representative vinyl resin VMCH primer formulations are given Table II.

Formula suggestions XE-766 and XE-5368 can be prepared entirely in a pebble mill, or the dispersion of TiO_2 for XE-766 can be made in vinyl resin VYHH on a two-roll mill. XE-771 and XE-5338 are prepared in two parts. The pigment in part A can be dispersed either by pebble mill or two-roll mill and subsequently blended with solution part B just prior to use. In XE-5338, the inclusion of high molecular weight vinyl resin VYDR makes the dried film more resistant when subsequent coats are applied and also contributes to overall film integrity.

Intermediate and Finish Coats

Three Distinct Types

The use of an intermediate coat implies that coatings of widely differing properties are being combined in a single system. The best example of this is the United States Navy ship-bottom system. In this system, three coatings are used to serve three distinct purposes. The wash primer is a metal conditioner which affords an excellent bond for subsequent coats and passivates the metal. The inter-

	XE-766	XE-771* A	XE-771* B
Titanium dioxide[1]	12.0	—	—
Basic zinc chromate[2]	—	3.8	—
Calcium carbonate[3]	—	1.3	—
Bakelite resin VMCH	8.0	—	5.0
Bakelite resin VYHH	8.0	5.0	—
Tricresyl phosphate	3.0	0.8	1.2
Methyl isobutyl ketone	34.5	19.6	21.9
Toluene	34.5	19.5	21.9
	100.0	50.0	50.0

Note: In XE-771, mix A and B just before use, to prevent gelation.

	XE-5368	XE-5338* A	XE-5338* B
Chromic phosphate[4]	16.0	—	—
Lead chromate[5]	—	5.72	—
Flexol plasticizer DOP	—	0.51	—
Tricresyl phosphate	4.0	2.40	—
Bakelite vinyl resin VMCH	16.0	—	6.72
Bakelite vinyl resin VYHH	—	1.11	—
Bakelite vinyl resin VYDR	—	5.30	—
Methyl isobutyl ketone	32.0	3.66	13.44
Toluene	32.0	—	13.44
Cyclohexanone	—	23.85	—
Methyl ethyl ketone	—	23.85	—
	100.0	66.40	33.60

*Note: Mix A and B just before use to prevent gelation.

(1) Such as "Titanox" A-168-LO, Titanium Pigment Corp., New York, N. Y.

(2) Such as du Pont Y-563-D, E. I. du Pont de Nemours Co., Wilmington, Del.

(3) Such as "Multifex" MM, Diamond Alkali Co., Cleveland, Ohio.

(4) Such as du Pont G-727-D, E. I. du Pont de Nemours and Co., Wilmington, Del.

(5) Such as Mineral Pigment M-1811, Mineral Pigments Corp., 1261 Broadway, New York, N. Y.

Table II. Primer formulations employing vinyl resin and lead pigment.

mediate, or anti-corrosive, coat acts as a moisture and corrosive salt barrier and contributes abrasion resistance and toughness to the whole system. The final, or anti-fouling, coat has none of the protective properties of the undercoats, but is intended solely to supply the poison that prevents growth of various marine organisms on the surface.

Generally speaking, in vinyl maintenance coating technology there is no need for the three distinct type of coatings used in the ship-bottom system. Very frequently, one or more coats of a finish based on vinyl resin VMCH, will do the job. However, by use of a vinyl resin VMCH primer, finish coats based on any of the copolymer resins can be applied, with resultant economies.

When a wash primer, or metal conditioner, is used, the system must consist of at least two or more separate coats. The wash primers are applied as an extremely thin film of 0.3 to 0.5 mils. This is for reasons of best performance as well as economy. Since vinyl resin VAGH is the only vinyl copolymer resin which adheres to the wash primer, the second coat must be based on this resin. For reasons of economy, subsequent coats are usually based on vinyl resin VYHH, although in some cases it may be less expensive to obtain the necessary thickness with vinyl resin VAGH based coating. The performance of topcoats based on either resin is equally good. A coating system utilizing one of the high molecular weight vinyl resins, such as resin VYDR, in the topcoat, could also be used at some sacrifice of coating solids. Such a coating based on resin VYDR shows to particular advantage where extraordinary chemical resistance is required or where the coating is subjected to temperatures above 150 deg. F. Also, it should be noted that the use of pigments or other modifiers susceptible to attack by moisture in an intermediate coat which is to be covered with a more resistant topcoat will lead to osmotic blisters.

The following, subject to the above limitations and suggestions, (Table III) are typical of formulations used for both intermediate and finish coats:

The formulas given in Table III are intended primarily for air-dry or baked maintenance systems where appearance is not of first importance. For this reason they may all be prepared in pebble mills. However, considerably better gloss and somewhat better overall durability is obtained if the finishes are prepared from two-roll mill chips or the equivalent. Aluminum pig-

	XE-5221[1]	XE-5322[2]	XE-5297[2]	XE-5295[2]	XE-5339
Bakelite vinyl resin VAGH	7.5	15.3	15.0	15.0	—
Bakelite vinyl resin VMCH	7.5	—	—	—	—
Bakelite vinyl resin VYDR	—	—	—	—	10.0
Leaded zinc oxide (35 per cent)	—	12.4	—	—	—
Titanium dioxide/ antimony oxide (9/1)	—	2.9	11.0	—	—
Aluminum powder	6.7	—	—	—	4.0
Carbon black	—	—	0.2	—	—
Red lead (97 to 98 per cent)	—	—	—	22.0	—
Flexol plasticizer DOP	1.5	—	3.0	—	—
Tricresyl phosphate	—	3.1	—	1.5	—
Flexol plasticizer TWS	—	—	—	1.5	—
Methyl isobutyl ketone—Toluene (1:1)	76.8	66.3	70.8	60.0	—
Methyl ethyl ketone—Cyclohexanone (1:1)	—	—	—	—	86.0
	100.0	100.0	100.0	100.0	100.0

(1) Intended as a general-purpose coating to be used over either bare steel or wash primer.

(2) May be made with resin VYHH-1 when intended for use over resin VYHH-1 or resin VMCH primers, or for use as the third coat in wash primer systems.

Table III. Typical formulations used for both intermediate and finish coats.

	XE-5382	XE-5363	XE-5235
Bakelite vinyl resin VAGH	7.4	12.6	15.1
Urea-formaldehyde resin[1] (dry)	—	2.5	4.2
Alkyd resin[2] (dry)	17.9	—	—
Alkyd resin[3] (dry)	—	8.8	—
Bakelite resin BR-18774	—	0.2	3.2
Titanium dioxide/Antimony oxide (9/1)	25.7	13.9	—
Titanium dioxide	—	—	12.9
Flexol plasticizer DOP	—	1.7	1.6
*Thinner	49.0	60.3	63.0
	100.0	100.0	100.0

*20 per cent cyclohexanone or isophorone
30 per cent methyl isobutyl ketone
50 per cent Xylene
(1) Such as "Uformite" F-240, Rohm and Haas Co., The Resinous Prod. Div., Philadelphia, Pa.
(2) Such as "Duraplex" C-55X, Rohm and Haas Co., The Resinous Prod. Div., Philadelphia, Pa.
(3) "Duraplex" ND-77B, Rohm and Haas Co., The Resinous Prod. Div., Philadelphia, Pa

Table IV. Formulations of coatings employing vinyl resin blended with alkyds.

ments can be stirred in. Aluminum pastes containing mineral spirits or similar solvents are not generally satisfactory due to the precipitating action of aliphatic hydrocarbons, which results in poor adhesion. However, these pastes can be used by balancing the aliphatic thinner with more active solvents such as ketones of comparable boiling range.

Alkyd Blends

Vinyl resin VAGH can be blended with air-dry alkyd resins to formulate high gloss brushing finishes. Similar blends of resin VAGH with urea resins and epoxy materials give high gloss, heat-stable, thermosetting baking coatings. Formulas for representative coatings of these types are given in Table IV.

In the previous finishes, maximum gloss is obtained by dispersing the pigment in vinyl resin VAGH on a two-roll mill and incorporating this dispersion after dissolving it in a portion of the thinner to form a pigment paste. In the case of XE-5382, the pigment can be ground in a pebble mill with the alkyd or the alkyd-VAGH mixture. XE-5382 is intended primarily as an air-dry coating for brushing or spraying. It can be used over bare metal or any type of oleoresinous or vinyl butyral resin primer. Coatings XE-5235 and XE-5363 are for baking applications only. XE-5363 is a high gloss metal decorative type for applications such as automobile finishes and can be used over a phenolic or oleoresinous type primer-surfacer. A 45-minute bake at 250 deg. F. up to a 10-minute bake at 350 deg. F. is recommended. XE-5235 is a type used primarily for cap and closure coatings over black iron or tin plate sheet, with or without a primer or "size." It has steam process resistance superior to any unmodified vinyl coating and also has a much higher softening point. Because of this latter characteristic, sheets coated on one side and baked, can be coated on the other side, restacked and the second coat baked without marring or sticking during the operation. Baking schedules used for this type of coating usually are in the range of 5 to 15 minutes at 375 to 350 deg. F.

Organosol Finishes

In the metal decorative field, one type of vinyl finish which is just becoming recognized for its excellent abrasion resistance and general durability is the organosol metal finish. Based on vinyl resin VYNV-1, a very high molecular weight, high vinyl chloride content resin, this baking coating offers the ultimate in toughness, inertness and chemical resistance for vinyl coating materials. A typical formulation is given in Table V.

Manufacturing Procedure

Preparation of Organosol: Charge resin VYNV-1, diisobutyl ketone, diluent, and 1/3 Flexol plasticizer DOP into a pebble mill and grind until a good dispersion is obtained.

Preparation of Pigment Paste: Charge pigment, lecithin and remainder of plasticizer DOP to pebble mill and grind until a good dispersion is obtained. With some pigments, a minor amount of aromatic solvent may be required to obtain the optimum grinding consistency.

Preparation of Base Solution: Charge toluene into mixing kettle. Add resin VAGH slowly until all the resin is stirred in and thoroughly wet. Add methyl Cellosolve, with agitation. Slight heat, carefully applied, will facilitate solvation.

Preparation of Coating: Charge organosol into a mixer and add the pigment paste while agitating. When thoroughly mixed, add base solution with agitation. Pebble milling of the organosol coating will improve the smoothness of the coatings and the gloss of the film.

The inclusion of vinyl resin VAGH is necessary to prevent air-dry mud-cracking of this dispersion type coating and to promote adhesion to vinyl butyral resin wash primer. Thinning to adjust for spray viscosity must be done using a special thinner based on 15 per cent diisobutyl ketone and 85 per cent "Solvesso" #100.

This organosol metal finish can also be prepared with vinyl resin VMCH replacing vinyl VAGH. This formulation will adhere to bare steel, rather than to the wash primer, but the performance of the system under conditions of high humidity or water immersion is not as good as XDE-5197.

Organosol-type coatings require more care in both preparation and application than the solution coatings. Since

(Turn to page 128)

Table V. Formulation of baking organosol metal coating.

XDE-5197
Red Organosol Metal Coating

Formula	Pounds	Gallons
Bakelite vinyl resin VYNV-1	20.7	1.78
Flexol plasticizer DOP	12.20	1.49
Diisobutyl ketone	7.20	1.08
High boiling diluent[1] (aromatic type)	21.70	3.01
Pigment[2]	3.50	0.22
Lecithin[3]	.05	—
Bakelite vinyl resin VAGH	5.20	0.45
Methyl Cellosolve	7.25	0.90
Toluene	21.80	3.06
Bakelite resin BR-18774	.40	.05
	100.00	12.04

(1) Such as "Solvesso" No. 100, Esso Standard Oil Co., New York, N. Y.
(2) Such as "BON" RT-565-D, E. I. du Pont de Nemours and Co., Wilmington, Del.
(3) Such as "Lecithin NS," Glidden Co. Soya Products Div., Chicago 39, Ill.

VEHICLE PROBLEMS

There is need for custom alkyds in small volume, low-cost epoxies, and heat stable vinyls

By
Harry Burrell*

Harry Burrell

THE industrial finishes business mirrors our standard of living. One of the principal distinguishing features of civilization in the United States as compared with other countries is the tremendous number of appliances, devices and gadgets which are used. These are important to us, not only because they make life easier and more pleasant, but because their production has become basic to our economy. The demand for them makes jobs, pays wages and taxes. This in turn allows more of them to be bought, thus creating a beneficial circle characteristic of our mode of life. An essential part of such items is the surface which must be attractively decorated and adequately protected from deterioration. Sales appeal depends as much on color and appearance as it does on function and design. Although the amount of paint used on an article is only an infinitesimal fraction of the total weight, and the added cost is usually less than 1%, the presence of the coating is as important as the hair-spring in a watch. As new devices are invented and brought into production the requirements for industrial finishes change. The progress in industrial finishes therefore reflects the changes occurring in many other fields of manufacture.

Typical Finishing Problems

This situation can be illustrated by a few examples. At the time of the New York World's Fair in 1939, an electric dishwasher was considered of sufficient novelty to warrant hourly demonstrations.

The success of dishwashers is due in no small part to the advent of synthetic detergents which do a much more thorough cleaning job than soap can do. Unfortunately, foaming in sewage disposal plants has not been the only technological problem resulting from increased detergent use. If the detergent efficiency is greater, so also is the ability to attack paint. As a result, improved finishing systems had to be developed to maintain resistance to the new conditions encountered. A similar situation exists with respect to washing machines, and in fact may be aggravated by more frequent spillage on exterior surfaces, compounded by the use of oxidizing bleaches.

In general, it might be said that the average kitchen is a torture chamber for appliance finishes, for many of the things we can put in our stomachs with impunity such as hot coffee, fats and salt are extremely deteriorating to surface coatings. For example, a snack of sardines may appear innocent enough peacefully juxtaposed in their can. But the combination of fish oil and hydrogen sulfide (generated by sulfur-containing protein at temperatures reached in processing the fish above the boiling point of water, are enough to remove even the proverbial silver lining of a cloud.

The manufacture of television receivers has now reached a stage where competition is keen. As a result, all means of reducing production costs are urgently needed. Few people realize what a high proportion of the cost of a TV set resides in the cabinet, but American tastes dictate that the appearance must resemble quality furniture. In this situation the industrial finishes manufacturer has supplied a decoration scheme which has reduced cabinet costs to one-third or less. More and more people are demanding to watch their programs in air-conditioned comfort, or at least to retire in a cool bed oom after watching a torrid murder mystery. The sale of air-conditioners has been growing steadily, and with it has grown the problem of protecting window units from sunlight, moisture and bird-lime.

The quality of automotive finishes has attained a generally satisfactory status, but as in most items, there is still pressure to reduce the costs. Polyester plastic bodies also present finishing problems which may become more acute if the fad for sports cars continues. The painting of plastics in general would seem rather like gilding the lily since plastics can be colored throughout, any shade desired. A matter of economics enters here since the general public seldom looks below the surface and scrap molding material is cheap. The practice of silvering plastics and other materials by depositing on them an alum num mirror has brought many problems to the industrial finishes manufacturer. Since an extremely high vacuum must be employed, many substrates must be primed to prevent evaporation of volatile material which would destroy the vacuum. A glass smooth substrate must also be provided. Since the

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a[illegible]minum coating is on the order of o[illegible]y a millionth of an inch thick it is e[illegible]ily rubbed off and must be protected b[illegible] a clear top coat which may be c[illegible]ored to resemble gold or some novelty e[illegible]ect. The foregoing serves to delineate s[illegible]me of the end use problems which the i[illegible]lustrial finishes producer must meet, a[illegible]d of course, the examples can be [illegible]ltiplied a hundredfold.

I[illegible]portant Vehicle Needs

Fortunately the vehicle chemist has a wide variety of polymers from which to choose in order to solve the problems presented to him. Even so, these frequently leave much to be desired since sometimes they do not have the combination of properties which will closely meet the requirements.

Alkyd resins were a great innovation when first introduced and represented a significant step forward in vehicle technology both from practical and theoretical considerations. Although based on oils long used for oleo-resinous varnishes, they represented the first approach to a synthetic vehicle. Since that time of course, many resins have become available which are oil free and truly synthetic. Today the oleo-resinous varnish appears to be headed for the fate of the passenger pigeon, although some uses such as marine varnishes and some can linings will probably continue to exist for some time. At present, alkyds used either alone or in conjunction with amine resins or nitrocellulose comprise the principal industrial finish. There are, however, many instances when such a system cannot meet the demands of the exposure conditions. Manufacturers of commercial alkyd resins must of necessity make only those types which have such general properties that they can enjoy general sale to a number of consumers. Since there is a myriad of possible combinations of physical and performance characteristics, the tendency among the larger finishes producers is to manufacture their own specialty resins which more closely satisfy their individual requirements. Many of these firms, and certainly most of the smaller companies, would rather purchase their alkyds than manufacture them if they could be tailor-made at a reasonable cost. A challenge therefore exists for the alkyd manufacturers to custom make resins to certain definite specifications in relatively smaller volume than that to which they are accustomed, and to do so at a cost which would be competitive with those existing in the present finishes manufacturers' plants. This would not seem to be impossible of attainment since development, capital and other costs must certainly be duplicated between the various alkyd users who are really making these resins only as a sideline. Alkyd manufacturers must not expect their customers to hand over formulas which have been derived at considerable expense. They must attack the problem scientifically and learn enough about their raw mate.ials and processing conditions to predict in advance fairly closely and promptly the necessary ingredients and conditions which will yield the combination of properties which their customers demand.

Epoxy resins have proved to be one of the most useful innovations in years. When alkali resistance, abrasion resistance and adhesion are required in sufficient degree to pay the price, the epoxies are the current answer. Therein, however, lies the current dilemma of the coatings manufacturer because in plain words the epoxies cost too much. The cost history of these resins has been very disappointing to the users because they were introduced at a price which made them rather attractive. On that basis coatings utilizing them were sampled to paint users and a very promising introduction of such coatings was made. Contrary to the normal cost reduction which usually occurs when an item gets into volume production, the cost of these particular resins was raised just as they started to get into full swing. No censure is intended by this statement and good reasons may have made the step necessary, but the fact remains that users were squeezed all down the line. As occurs with many materials when they are introduced, the maintenance of consistent quality from batch to batch of epoxies leaves something to be desired. Since the present demand does not seem to be met by the present production capacity, there would seem to be little hope in the immediate future of any price relief. However, competition is developing and from the point of view of the consumer it is most welcome.

The most neglected field of vehicles, and the one which shows the most promise for the future, is the vinyl type. A great deal of research and promotion has been done here, but in relation to the total amount of industrial finishes sold only a miniscule amount is vinyl based. The heat stability and adhesion of this type coating can stand considerable improvement. Viscosities are too high, and the rheological properties of organosols prevent many applications. The dilemma, of course, is that in order to get the physical properties required, the molecular weight must be high and this results in low solids or heavy bodies. What may be needed is a highly branched molecule, capable of cross-linking, similar to the molecular structure of alkyds. The patent literature contains a plethora of examples of cross-linking vinyls, but somehow they never become commercial. With raw materials cheaper than oils, the vinyl resins comprise a fertile field for development.

A related group of vehicles which seems to be progressing is that of the hydrocarbon oils. Petroleum-based drying oils are old, and usually not well thought of because of dark color and embrittlement on aging. Some new polybutadiene polymers and copolymers show encouraging properties and will bear watching.

The success of latex paints in trade sales has prompted much research in the industrial field, but most of the results have been negative. The economics and non-flammability of water are powerful directives for further work. A water based vehicle, preferably in solution rather than suspension, which would wet oil-contaminated metal, flow and bake out like current industrial finishes, and have equal film properties, would be a world beater.

Much work has been done since the war on the theory of polymer degradation, particularly in the plastics and rubber fields. This information has not yet been properly studied and assimilated by vehicle manufacturers. It is believed that considerable improvement in durability could be attained by taking advantage of this information in modifying vehicles. In another aspect of this problem, we have always been concerned with trying to improve the impermeability of protective films. It has been thought instinctively that if water and air could be kept away from a metallic substrate that it could be protected from corrosion. Studies on diffusion and permeability of polymers have shown that even the best of them will transport far more moisture and oxygen than is required by the kinetic stoichiometry of corrosion. The reason why films work as well as they do seems to be tied up in their electrical resistance. Yet this property is almost completely unknown for film formers.

If an ideal vehicle were to be developed for industrial finishes it would be:

a) cheap
b) colorless
c) resistant to discoloration by sunlight and temperatures to 500°F.
d) of low viscosity
e) soluble in water or aliphatic solvents
f) easily cross-linked at low temperatures or short times at higher temperatures
g) high in electrical resistance in the presence of moisture
h) resistant to degradation, solvents and chemicals
i) marproof, tough, flexible and of good adhesion.

ALUMINUM ALCOHOLATES

A NEW GROUP OF PAINT ADDITIVES

By
J. Rinse*
Consultant

COATING vehicles are built from a great variety of organic compounds, principally oils and resins, with minor quantities of lead, cobalt and manganese compounds, which act as catalyst for the polymerization and oxidation of the organic compounds. Some of the newer coatings are being cured by means of crosslinking agents, e.g. di- and poly-amines and amides.

Frequently other metal soaps, in particular, from aluminum and zinc are also used as paint additives to prevent settling of pigments or to act as flattening agents. These soaps are not reactive with the other components of the vehicle but stay in the paint and finally in the film as a physical mixture.

Recently, groups of reactive metal compounds have been developed, including titanium and aluminum alcoholates which participate in the reactions of formation of vehicles and coatings. The titanium alcoholates have already been proposed as such in 1948,[1] but so far have not found extensive applications, because of limited availability and high cost.

The aluminum alcoholates have recently been described in English[2] and German[3] technical journals as additives to drying oils and alkyds, and are being used to thicken or even cause complete gelation of these vehicles.

It appeared that aluminum alcoholates are highly reactive compounds, which even in small quantities (0.5-2%) may cause complete gelation of heavy bodied oils and of alkyds.

*Dr. J. Rinse is associated with Chemical Research Associates, Bernardsville, N. J.

We have been studying the preparation of aluminum alcoholates, their properties and their application in various industries and have found that they are capable of changing and improving the properties of paints and greases and that they probably will have uses in many other industries. At the same time their fundamental properties have become better understood.

Preparation

Aluminum alcoholates are made by reacting aluminum metal with a suitable alcohol. Propanol, butanol and their isomers may be used but also the higher ones like capryl and octyl-alcohol have been utilized. The reaction evolves hydrogen and a liquid or solid aluminum alcoholate $[Al(OR)_3]$ remains in the reaction kettle. This is purified by vacuum distillation or by filtering a solution of the crude product. The alcoholates are readily soluble in various solvents like aliphatic and aromatic hydrocarbons and alcohols. They are sensitive to water, which decomposes them into alcohol and aluminum hydrate.

Chemical Properties

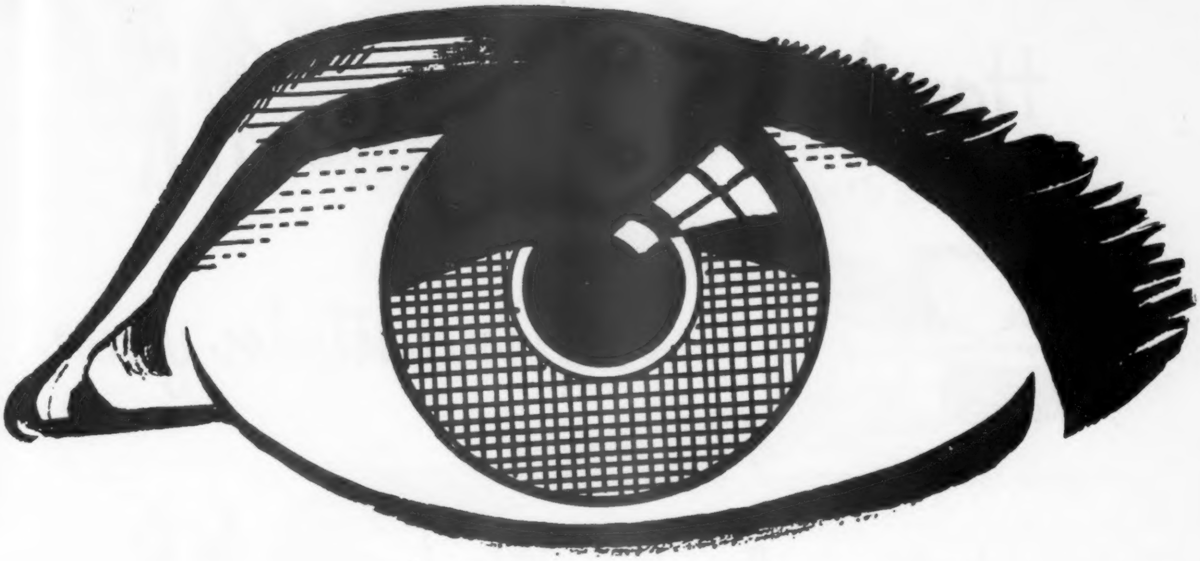
The alkoxy groups of the aluminum alcoholates are only loosely bound to the aluminum atoms and may be replaced by higher alkoxy groups and by carboxyl groups particularly those of fatty acids. During these reactions which proceed at room temperatures, equivalent quantities of the original alcohol used for preparing the aluminum alcoholate, are liberated and may be removed by distillation. Each molecule of aluminum alcoholate will react with three molecules of higher alcohols or with two molecules of fatty acids. With alcohols the higher aluminum alcoholate is formed and with fatty acids aluminum mono- or di-soaps will be obtained. Like the original aluminum alcoholate, they are still sensitive to water which exchanges alkoxy groups for hydroxyl groups. The aluminum mono- and di- soaps having only two respectively, one alkoxy group becomes transferred by water into the corresponding regular aluminum soaps. The fatty acid groups are not affected by water.

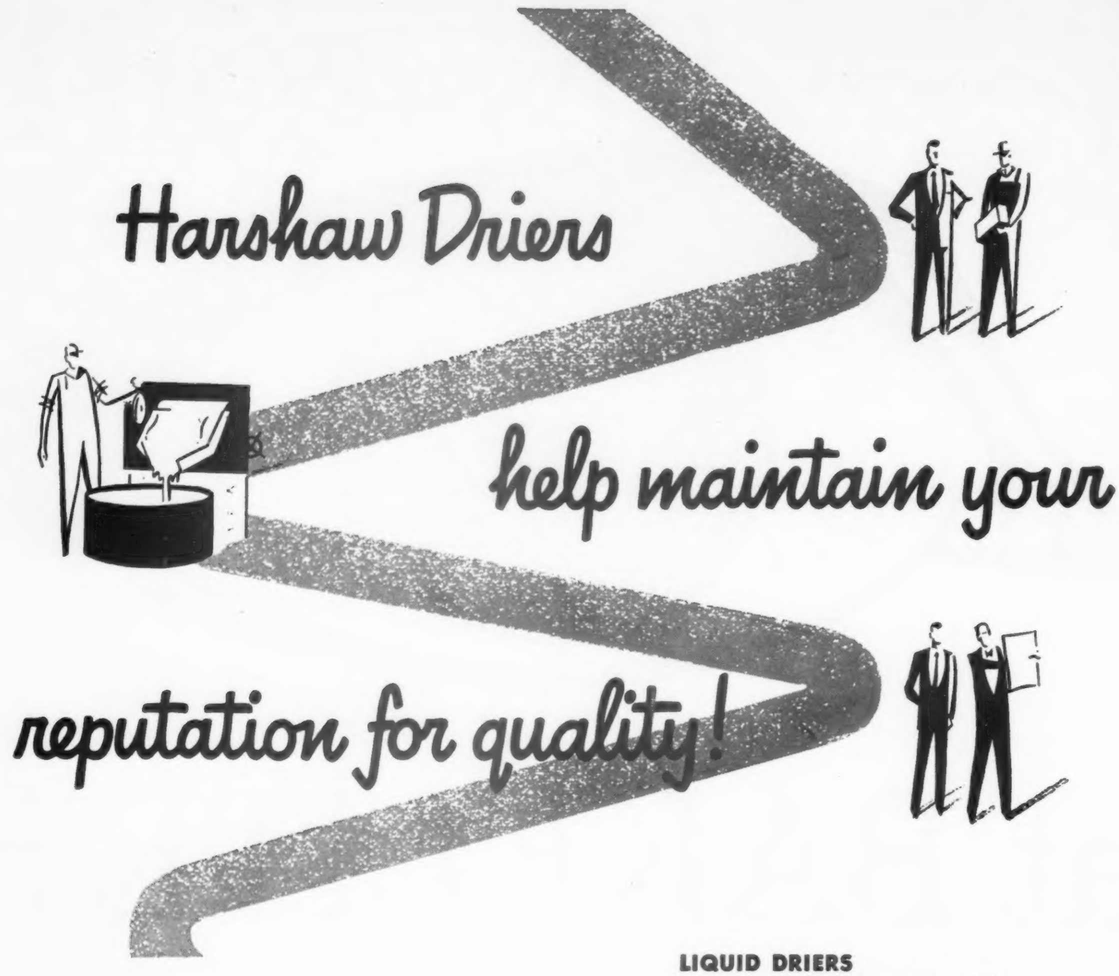
Application in Paint Vehicles

Most paint vehicles contain some free fatty acids, either as such or polymerized, and these fatty acids will react directly with the aluminum alcoholate. With single fatty acids only a slight increase in viscosity occurs, but dimer and polymer fatty acids cause a great increase even in the formation of grainy, insoluble particles because of crosslinking.

Heavy bodied oils and alkyds contain free hydroxyl groups and these react also with the aluminum alcoholates. Because of the large size of the polymerized oil and alkyd molecules, they are likely to contain several carboxyl and hydroxyl groups and when mixed with only small amounts of aluminum alcoholate, a considerable rise in viscosity occurs. Accordingly, the vehicles to be treated with aluminum alcoholates should not contain a large excess of hydroxyl or carboxyl groups.

(*Turn to page 145*)





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- **Flash point (T.C.C.)**
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- **Acid value**
- **Miscibility with raw linseed oil**
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- **Pastalls**

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- **Linoresinate Solids**
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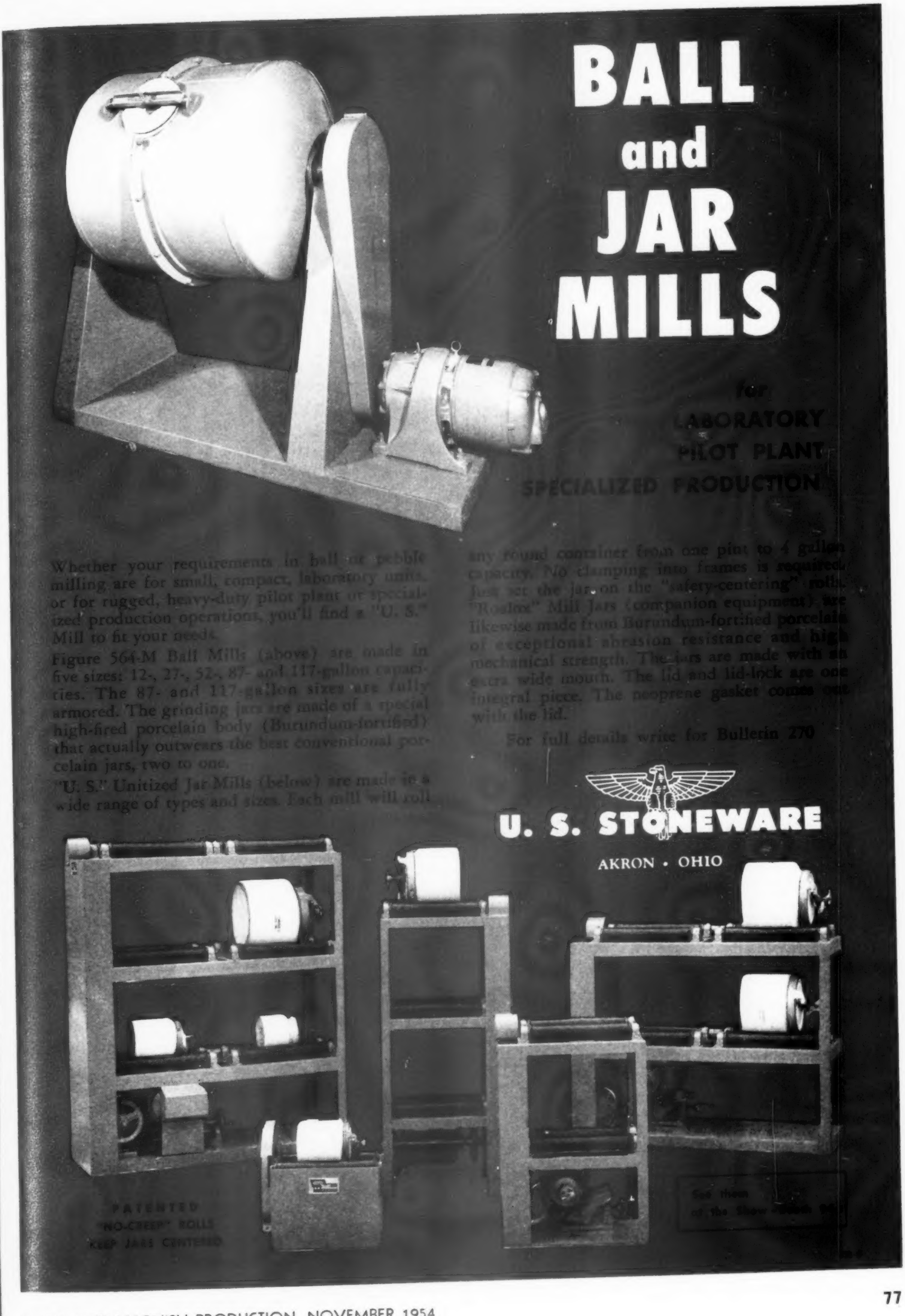
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Like the diamond cutter and his exacting calculations, Canco exercises meticulous care in every detail of container production.

For you, Canco's relentless effort to produce perfect containers means fewer work stoppages on your production lines, lower packing costs and maximum container efficiency throughout your channels of distribution.

Canco's precise specifications for its containers are arrived at only after exhaustive laboratory tests, pilot-line manufacturing trials and experimental packs. This zeal for container perfection also applies to raw materials, packing—even shipping.

That's why the containers which roll off Canco lines can best take your products to market at a profit.

Go first to the people who are first!

AMERICAN CAN COMPANY

CANCO

New York, Chicago, San Francisco; Hamilton, Canada

Canco offers you the finest full line of paint, putty and turp cans available anywhere. Through the years Canco, in cooperation with your industry, has helped you *sell* in all markets more efficiently, more effectively.

OFFICERS OF NATIONAL PAINT, VARNISH and LACQUER ASSOCIATION

JOSEPH F. BATTLEY
President

BERNHARD MAUTZ
Vice-President

PROGRESS THROUGH COOPERATION
66th ANNUAL CONVENTION
NATIONAL PAINT, VARNISH AND LACQUER ASSN.

"PROGRESS MAKES PROSPERITY"

H. BRAITH DAVIS
Treasurer

DAVID H. MORAN
Chairman, Exec. Comm.

OFFICERS OF FEDERATION OF PAINT and VARNISH PRODUCTION CLUBS

C. J. OVERMYER
President

N. P. BECKWITH
President-Elect

Federation of Paint and Varnish Production Clubs

YE OLDE PAINT STONE 1737

32nd ANNUAL MEETING

M. A. GLASER
Treasurer

C. HOMER FLYNN
Executive Secretary

66th NATIONAL ASSOCIATION CONVENTION

General Sessions

Monday, Nov. 15
2:30 P.M.

Call to Order and Our National Anthem
Invocation, F. L. Sulzberger
Welcome to Delegates

Federation of Paint and Varnish Production Clubs
—Calvin J. Overmyer, President.

National Paint Salesmen's Association
—Thomas M. Gminder, President.

Painting and Decorating Contractors of America
—William Gelfan, President.

Retail Paint and Wallpaper Distributors of America
—E. L. Lewis, President.

American Tung Oil Association
—Marshall Ballard, Jr. President.

Canadian Paint, Varnish and Lacquer Association
—C. C. Pettet, President.

All Pakistan Paint Manufacturers' Association
—Rahim Bux Khan.

Asociacion Nacional de Fabricantes de Pinturas y Tintas
—Lazaro Aanenz Gomez.

In Memoriam — H. E. Stone
By-Laws Comm. Report — J. V. Thompson, chairman

President's Address — Joseph J. Battley
Treasurer's Report — H. Braith Davis
Nomination Comm. Report — V. Wurtele, chairman

"The National Defense Mobilization Program" — A. S. Flemming

Tuesday, Nov. 16
9:30 A.M.

Industrial Product Finishes Div. — J. A. Hager, chairman

"Success and Failure in Communications" — Dr. S. I. Hayakawa

"Blueprint for Industrial Statesmanship" — H. C. McClellan

2:00 P.M.

Trade Sales Manufacturers' Forum — A. A. Shuger, chairman

Wednesday, Nov. 17
9:30 A.M.

"Toward 1955, With Hope or Fear" — L. M. Cherne

Final By-Law Comm. Report — J. V. Thompson, chairman

Consideration of Comm. Reports and Resolutions

Final Report of Nominating Comm. — V. Wurtele, chairman

Election of Officers

Unfinished and New Business

Adjournment

Forums, Meetings and Panels

Monday, Nov. 15

10:00 A.M.

Advertising and Sales Promotion Managers' Forum — G. M. Breinig, chairman

Roof Coating and Roof Cement Manufacturers' Forum — H. R. Allison, chairman

Wholesale-Distributors Meeting — H. B. Weatherford, chairman

Tuesday, Nov. 16
9:30 A.M.

Putty, Glazing and Caulking Compound Forum — N. M. Cornell, chairman

12:30 P.M.

Industrial Product Finishes Manufacturers Panels

Social Events

Monday, Nov. 15
6:00 P.M.

President's Reception

Tuesday, Nov. 16
12:30 P.M.

Men's Luncheon

Wednesday, Nov. 17
12:30 P.M.

Men's Luncheon

32nd FEDERATION ANNUAL MEETING

Wednesday, Nov. 17

10:00 A.M. Meeting of Constituent Club Council Representatives

12:15 P.M. Meeting of Federation Comm. Chairman

2:00 Meeting of Federation Council

8:00 Meeting of Constituent Club Officers

Thursday, Nov. 18

Morning Session

10:30 A.M. Invocation — V. C. Bidlack
Greeting — Pres. C. J. Overmyer
Welcome — R. C. Adams, E. J. Murphy, L. B. Odell, C. L. Smith

10:45 Mechanisms of Paint Film Breakdown: I — Detroit Club

11:05 Nomograph for Alkyd Resin Formulation — Northwestern Club

11:20 President's Report — C. J. Overmyer

11:35 Address — J. F. Battley, Pres. of NPVLA

11:45 Fume Control in the Paint and Varnish Industry — Dr. C. W. Selheimer of Illinois Institute of Technology

Afternoon Session

2:00 P.M. Calibration of the Sward Rocker — Los Angeles Club

2:20 Significance of the Tack-Free Test — New York Club

2:45 Keynote Address ("Skeptical Strangers or Friends?") — Dr. J. T. Rettaliata, president of Illinois Institute of Technology

3:45 Study of Pigment Dispersion: V Behavior of Toluidene Red — New York Club

4:05 Research Related to Protective Coatings at the Utilization Research Branches — Dr. J. C. Cowan, U. S. Dept. of Agriculture, Northern Utilization Branch, Peoria, Ill.

4:35 Annual Business Meeting — Report of Elections

Friday, Nov. 19

Morning Session

10:00 A.M. Paint Industry Literature Classification — Golden Gate Club

10:20 Painting of Plaster Surfaces: II — Cleveland Club

10:40 Observations on Some Testing Methods — Dr. H. A. Hampton, sponsored through OCCA, London, England

11:20 Studies on the Formulation of Fire Retardant Paints — Baltimore Club

11:40 Pakistan and the Paint Industry — R. Bux-Khan, Buxley Paint Works, Karachi, Pakistan

11:55 Correlation on the Color Apitude Test — Dr. F. L. Dimmick, U. S. Naval Medical Research Lab., U. S. Naval Submarine Base, New London, Conn.

Afternoon Session

2:00 P.M. Fume Control — Chicago Club

2:20 The Joseph J. Mattiello Lecture — Dr. J. J. Long, Devoe & Raynolds Co., Louisville, Ky.

3:20 Report of Federation Education Comm. — F. M. Damitz, chairman
Educational Session — Opportunities in the Paint Industry, W. R. Barrett, Rinshed-Mason Co., Detroit, Mich.

3:35 Toward a Better Knowledge of Oil Bodying — Dr. G. Petit, director of Paint and Varnish Lab., Bellevue, France, sponsored through (FATIPEC)

3:55 Stress-Strain Properties of Films of Pigmented or Emulsified Alkyds — Dr. W. Bosch, North Dakota Agricultural College, Fargo, N. D.

4:25 Study of Primers for Ferrous Metals in an Atmosphere Exposure: VII — New England Club

4:45 Systematic Study of Low Odor Alkyd Paints — CDIC Club

Saturday, Nov. 20

Morning Session

10:00 A.M. Panel Discussion — Polyvinyl Acetate Interior and Exterior Paints

12:30 P.M. Meeting Closes

2:00 P.M. Finance Comm. Meeting

Social Events

Wed., Nov. 17, 6:15 P.M. — Council

Thursday, Nov. 18, 8:00 P.M. — Bridge Tournament and Past Presidents' Dinner

Friday, Nov. 19, 6:30 P.M. — Annual Banquet and Dance

Registration will open at noon, Wednesday, Nov. 17, and at 8:00 A.M. daily thereafter. The Paint Industries' Show will open 2:00 to 6:00 P.M., Tuesday, Nov. 16 and from 9:30 A.M. to 6:00 P.M. thereafter. The show will close Saturday, Nov. 20 at 2:00 P.M.

A

BOOTH NO.

PAUL O. ABBE — 13
Little Falls, N. J.
Ball and Pebble Mixers.
O. Garlick, R. Kleinfeldt, R. Ringen, N. Toussaint

ADVANCE SOLVENTS & CHEMICAL CORP. — 100
New York 16, N. Y.
Paint Driers (Zirconium, Naphthenates, Octoates and Tallates), Fungicides, and Paint Makers Specialties.
A. Mullaly, C. Lechner, A. Baracani, G. Gregg
J. Young, A. Talcott, R. Kriney, W. Tucker
M. Antonovich

AMERICAN CYANAMID COMPANY — 59, 60
New York 20, N. Y.
Line of Coating Resins.
E. Bradshaw, T. Brude, C. Byron, L. Cadwell
F. Charlesworth, E. Gordon, H. Cyphers, F. Dubbs
L. Dutt, S. Garland, R. Harris, R. Head
W. Hensley, R. Hoekelman, J. Johnson, W. Lambert
V. Lindgren, G. Martin, L. Moore, J. Morris
W. Norris, J. Oliver, W. Patrick, C. Romieux
J. Sanderson, F. Stickle, E. Trussell, R. Verdery
T. Wennergren, W. Whitescarver

— See Advertisement 3rd Cover —

ANDERSON-PRICHARD OIL CORPORATION — 16
Oklahoma City, Okla.
Naphthas, Solvents, Asphalt, Pitch.
C. Dresser, D. Rubek, R. Johnson, E. Rooney

ARCHER-DANIELS-MIDLAND COMPANY — 23
Minneapolis, Minn.
Blister Resistant Paints, Shingle Stain, Trim Enamels, Interior Finishes, and the "Week-End Decorator."
T. Daniels, J. Moore, M. Gruber, W. Andrews
P. McClay, W. Weismann, D. Copenhaver, A. Hoehne
F. Eberman, J. Daniels, G. Fowler, D. Marien
R. Mairs, T. Garfield, J. Burkholder, J. Geiss
P. Dearing, E. Kaufman, B. Schroeder, D. Birkeland
R. Mathews, R. Jerabek, J. Konen, H. Dillon
J. King, S. Cooke, A. Hovey, S. Thompson
J. Greenfield, A. Olotka, E. Sklarz, W. Dodds

— See Advertisement Page 31 —

ATLAS ELECTRIC DEVICES COMPANY, INC. — 15
Chicago, Ill.
Accelerated Weathering Machines.
J. Lane, B. Alport, J. Norton, R. Metzinger
L. Schrachta

B

BOOTH NO.

BAKELITE COMPANY — 2, 3, 4, 5
Div. of Union Carbide and Carbon Corporation
New York 17, N. Y.
Decorative and Protective Coating Materials, Formulating Techniques.
C. Patton, R. Calsibet, R. Norum, F. Bertics
L. Veale, K. McCullough, W. Sullivan, F. Foxlee
G. Wells, V. Larson, C. Schwahn, L. Maines
R. Quarles, A. Downes, S. Richardson, L. Whiting

— See Advertisement Pages 72, 73 —

BAKER CASTOR OIL COMPANY — 52
New York 5, N. Y.
Dehydrated Castor Oil, Paint Additives.
H. Fritts, J. Hayes, T. Patton, B. Lindlaw

— See Advertisement Page 115 —

BARRETT DIV. — 47, 48
Allied Chemical & Dye Corp.
New York, N. Y.
Line of Coating Resins.
C. Ellis, V. Ginsler, H. Hoppens, G. Roberts
H. Stumpe, L. Lemley, D. Delaney

— See Advertisement Page 26 —

BENNETT INDUSTRIES, INC. — 68
Peotone, Illinois
Paint Pails, Special Mixing Tanks.
S. Bennett, H. LePan, R. Taylor, Jr., R. Ernst
D. Keough

BINNEY & SMITH, INC. — 92
New York 17, N. Y.
Iron Oxide Colors, Bone Blacks, Synthetic Iron Oxide, Lampblack.
Downs, Gotshall, Kealy, Kocik
Loges, Smith, Stiff, Venuto

— See Advertisement Page 8 —

BOWSER, INC. — 8[illegible]
Ft. Wayne, Ind.
Liquid Control Equipment, Metering, Filtering, Pumping, Storing, Dispensing, and Lubricating Techniques.
H. Slack, H. Smith, A. Meuler, C. Chapman
E. Ellestad, F. Kirk

BRIGHTON COPPER WORKS, INC. — 7[illegible]
Cincinnati 4, Ohio
Portable Varnish Kettles, Set Kettles, Laboratory Kettles.
A. Hock, Jr., R. Schneider

C

BOOTH NO.

GODFREY L. CABOT, INC. — 7
Boston 10, Mass.
Wollastonite and Carbon Blacks.
Duffy, Marsh, Carpenter, Jr., King, Jr.
Browning, White, Schroth, Peabody
Jordan, Berstein

CARBIDE AND CARBON CHEMICALS CO. — 39, 40
Div. of Union Carbide and Carbon Corporation
New York 17, N. Y.
Plasticizers, Products from Coal Hydrogenation for Phenolic Resins, Solvents for Surface Coatings.
J. Berry, T. Curtis, T. Grady, H. Kelly
B. Lupton, R. Martin, H. White
— See Advertisement Page 11 —

CARBOLA CHEMICAL COMPANY, INC.
Natural Bridge, N. Y.
Pigment Extenders.
H. Higgins, K. Roast, H. Koenig, E. Spriggs
W. Smart, C. Holmes
— See Advertisement Page 132 —

CARBON DISPERSIONS, INC. — 71
Newark 5, N. J.
Dispersions of Carbon Black and Other Pigments.
A. Brauch, E. Sheridan
— See Advertisement Page 116 —

CARGILL, INC. — FALK QUALITY PRODUCTS — 8
Minneapolis 15, Minn. or P.O. Box 1075, Pittsburgh, Pa.
Linseed Oil, Fish Oil, Specialty Products.
S. Aronoff, S. Rogaliner, M. Kantor, S. Gutkin
A. Klobe, J. Weisman, J. O'Hara, T. Friday
— See Advertisement Page 4 —

CATALYTIC COMBUSTION CORP. — 67
Detroit 8, Mich.
Industrial Fume Combustion Systems.
P. Goodell, R. Ruff, A. Hutchison

CELANESE CORPORATION OF AMERICA — 14
New York 16, N. Y.
Vinyl Acetate, Pentaerythritol, Normal Butanol, Butyl Acetate, Propyl Acetate, Plasticizers.
J. Stevens, R. Kampschulte, D. Hecht, G. Nelson
M. Curry, J. Wyart, N. Baker, T. Davis
— See Advertisement Page 12 —

COORS PORCELAIN COMPANY — 82
Div. of LZP Industrial Ceramics
Denver 4, Colo.
High Density Grinding Media, High Density Mill Lining Brick.
B. Landes, C. Taylor

CUNO ENGINEERING CORP. — 62
Meriden, Conn.
Filtration Equipment.
H. Munday, W. Grupe, J. Duff, G. Miller
— See Advertisement Page 123 —

D

J. H. DAY COMPANY, INC. — 36, 37, 38
Cincinnati 22, Ohio
Roller Mills, Pony Mixers, Tinting and Reducing Mixers, Dispersion and Putty Mixers.
J. Diltz, P. Russell, A. Lockhart, J. Nolan
W. Bruestle, I. Wershay, R. Mader

BOOTH NO.

DOW CHEMICAL COMPANY — 6
Midland, Mich.
Latex for Interior and Exterior Paints, Vinyltoluene and other Monomers.
F. Gunn, M. Morand, D. Gibb, C. Branch
D. Ebey, M. Johnson, N. Peterson, E. Stilbert
W. Henson, F. Buege, A. Cipriano, R. Drubel
R. Helmreich, F. Quigley, Jr., J. Huffman, M. Kelly
R. Lalk, R. Simon, H. Walters, M. Christen
P. Wilson, C. Sullivan, T. Gow, D. Schurr
J. Donalds, J. Baumgartner, R. Visger, R. Kugler
H. Haskell, J. Stewart
— See Advertisement Page 18 —

E. I. du PONT de NEMOURS & COMPANY — 64
Wilmington 98, Del.
Polyvinyl Acetate Emulsion for Exterior Paints, Interior Paints and Primer Sealers.
C. Argana, H. Beardsley, R. Emmick, W. Pearson
H. Sawyer, R. Seidel
— See Advertisement Pages 121, 143 —

E

EASTMAN CHEMICAL PRODUCTS, INC. — 21, 22
Kingsport, Tenn.
Butyrate Film Former, Melt Coatings, and Heat Sealable Adhesives.
J. Langston, R. Shelly, J. Sanders, K. Cox
D. Campbell, H. Hannabass, F. Ball, J. Crowly
W. Gearhart, C. Penning, C. Lee, R. Moore
H. Reebel
— See Advertisement Page 10 —

EPWORTH MANUFACTURING COMPANY, INC. — 49
Detroit 10, Mich.
Paint Manufacturing Machinery.
C. Zink, E. Jeanne, F. Koepke, C. Leith

F

FIRESTONE PLASTICS COMPANY — 63
Pottstown, Pa.
Vinyl Resins and Paint Latexes.
R. Williams, T. Henry, J. Rosenson, W. Boyer
H. Cooper, G. Sollenberger

G

GARDNER LABORATORY, INC. — 33, 34
Bethesda, Md.
Measuring Instruments, Testing Devices, Laboratory Equipment.
F. Weeks, R. Griffee, M. Cattaro, J. Duggar
A. Gillies, P. Gardner, H. Gardner, Jr.

GENERAL ELECTRIC COMPANY — 1
Chemical Div.
Pittsfield, Mass.
Flexibility Tester, Panels Showing Properties of Coating Resins, Silicone Products for Paint Industry.
Aldrich, Blagen, Bulgozdy, Burnett
Dugan, Hartley, Koehler, Lanson
Loritsch

GEUDER, PAESCHKE & FREY COMPANY — 81
Milwaukee 1, Wis.
Steel Shipping Containers.
A. Savee, L. Flashberger

GOODYEAR TIRE & RUBBER COMPANY — 87, 88, 89
Akron 16, Ohio
Resins and Latices.
H. Thies, R. Workman, C. McNeer, J. Bear
R. Draman, R. Earhart, W. Gerrow, J. Houlette
J. Hunter, R. Kann, W. Kelly, H. Sell
I. Lanning, R. Luskin, F. Milward, D. Neese
J. Platner, A. Polson, C. Pyne, E. Scott
L. Stanton, R. Wallace, J. Warner, R. Fremgen
D. Hilliard

H

BOOTH NO.

HARSHAW CHEMICAL COMPANY 45, 46
Cleveland 6, Ohio
Driers, Pigments, Polyvinyl Acetate Emulsions, Vinyl Stabilizers.

W. Harris	W. Straka	J. Dickenson	G. Unkefer
G. Duro	J. Helle	C. Juredine	J. Kingsbury
V. Weir	A. Giordano	C. Rock	A. Waters
F. Folson			

— See Advertisement Page 74 —

HERCULES POWDER COMPANY 69, 70
Wilmington, Del.
Synthetic Resins, Chlorinated Rubber, Pentaerythritol, Cellulose Derivatives.
Representatives from all departments.
— See Advertisement Pages 113, 140 —

HERMAN HOCKMEYER & COMPANY 75
New York 59, N. Y.
Mixing Machinery.
S. Klein H. Hockmeyer

K

SPENCER KELLOGG and SONS, INC. 57, 58
Buffalo 5, N. Y.
Vegetable Oils.

V. Acer	D. Healy	A. Kohl	Dr. A. Schwarcman
R. James	D. Farstad	R. Nagel	D. McCready
L. Chase	T. Weiffenbach	J. Tarrant	

— See Advertisement Page 111 —

KENT MACHINE WORKS, INC. 65
Brooklyn 1, N. Y.
Mixing and Grinding Machinery.
E. Peters F. Weitzner
— See Advertisement Page 139 —

KINETIC DISPERSION CORPORATION 74
Buffalo 16, N. Y.
Dispersing Mill for Water Paints.

C. Kew	L. Behrns	H. Ellsworth	R. Wheeler
E. Hiller	D. Hazen		

— See Advertisement Page 106 —

L

LACQUER INFORMATION CENTER 31, 32
Latest Developments in Lacquer Technology, Formulation and Application.

Bede Products, Inc.	Carbide and Carbon Chemicals Co.
The DeVilbiss Co.	Enjay Company, Inc.
Hercules Powder Co.	Shell Chemical Corp.
Spee-Flo Co.	

J. M. LEHMANN COMPANY, INC. 86
Lyndhurst, N. Y.
Roller Mills, Ball Mills, Mixing Machinery, Pulverizers, Sieving and Straining Machinery, Grinding Machinery.
C. Hoffman J. Sarlat H. Mierswa C. Dittman
— See Advertisement Page 13 —

M

MACBETH DAYLIGHTING CORP. 43
Newburgh, N. Y.
Lamps for Color Matching, Colorimeter, pH Meters.

F. Jemsen	W. Souders	R. Varick	D. Osgood
M. Straith	W. Reese	R. Meeker	

— See Advertisement Page 30 —

BOOTH NO.

MANUFACTURERS ENGINEERING & EQUIPMENT CORPORATION 76
Hatboro, Pa.
Differential Colorimeter, Glossmeter.
J. Copeland S. Klein

METALS DISINTEGRATING COMPANY, INC. 24
Elizabeth, N. J.
Metal Pigments, Aluminum Plates and Powders, Gold Bronze Powders, Pulverizing Equipment.

H. Collins	H. Hall	J. McKinley	E. Timm
R. Town			

MINERAL PIGMENTS CORPORATION 50
Muirkirk, Maryland
Light Fast Molybdate Orange, Chrome Oranges and Yellow, and Techniques for Dispersing These Colors.

N. Scowe	J. Hill	W. Hartmeyer	H. Weisberg
J. Devine	A. Insley	G. Foos	

MINERALS & CHEMICALS CORPORATION of AMERICA 99
Metuchen, N. J.
Extender Pigments.

A. Blake	R. Dilley	Dr. C. Albert	P. Wheeler
O. Hempel	R. Wilkerson	H. Smith	R. Hubbell, Jr.
C. Martin			

— See Advertisement Page 15 —

MONSANTO CHEMICAL COMPANY 402, 403
Springfield 2, Mass.
Melamine, Urea, Phenolic, Vinyl Butyral, Latices.

T. Martin	C. Parker	T. Gordon	E. MacPherson
S. Francis	A. Goodacre	J. Cochran	R. Schmidt
F. Meushke	J. Constance		

— See Advertisement Page 109 —

MOREHOUSE INDUSTRIES 97, 98
Los Angeles 65, Cal.
Milling Equipment.

G. Morehouse	L. Smoot	G. Missbach	M. Horst
D. Grubbs	J. Horst		

N

NAFTONE, INC. 66
New York 22, N. Y.
Naphthenate Driers, Anti-Bodying Agent for Odorless Flat Alkyds, Anti-Flocculating Agent for Water Dispersed Paints, Anti-Skinning Agent and Fungicides.

A. Applegate	H. Johnson	C. Klebsattel	J. Martin
G. McTavey	E. Pflueger	J. Smith	

NATIONAL STARCH PRODUCTS, INC. 93
Plainfield, N. J.
Polyvinyl Acetate Emulsions and Polyvinyl Acetate Copolymer Emulsions.

D. Pascal	J. Dillon	H. Zahrndt	L. Horan
C. Steed	J. Stern	D. Tikker	J. Gallagher
S. Thune			

— See Advertisement Page 21 —

NEVILLE CHEMICAL COMPANY 19, [illegible]
Pittsburgh 25, Pa.
Coumarone and Petroleum Resins, Shingle Stain Oils, Aromatic Solvents.

Dauler	Evans	James	Lauderbaugh
Craig	Isenberg	Villing	Freeman
Wald			

— See Advertisement Page 125 —

NOPCO CHEMICAL COMPANY 84
Harrison, N. J.
Polyvinyl Acetate Emulsions, Anti-Foamers, Thickeners.

O. Lohrke	F. Licata	F. Leonard	J. Fritz
E. Weierich	T. Rankin		

BOOTH NO

N ODEX PRODUCTS COMPANY, INC. 95, 96
E abeth, N. J.
D ers, Mixing and Milling Aids, Fungicides, Anti-S nning Agents, Loss of Dry Inhibitors, Bodying A nts.

L oon	D. Roon	A. Minich	W. Houston
F wyer	K. Price	C. Kaiser	W. Stewart
D J. Skeen	E. Horgan		

— See Advertisement Page 20 —

P

P CIFIC VEGETABLE OIL CORPORATION 73
L s Angeles 23, Cal.
V getable and Marine Oils, Safflower Oil.
R. Garoutte D. Gratz
— See Advertisement Page 79 —

P TTERSON FOUNDRY & MACHINE COMPANY 77, 78
East Liverpool, Ohio
Steel Ball Mills, Thinning and Tinting Mixer.
Representatives from all Departments.

PENNSYLVANIA INDUSTRIAL CHEMICAL CORP. 35
Clairton, Pa.
Coumarone, Terpene, Polystyrene, Petroleum Hydrocarbon Resins, Petroleum Solvents.

F. Elliott	J. Wilson	K. Jackson	L. Wolfe
W. Davis	E. Steinmark	L. O'Rourke	J. McBride
R. Kinny	D. Braun		

R

R-B-H DISPERSIONS 53
Bound Brook, N. J.
Pigment Dispersions.
R. Lynch R. Galowitsh H. Norris J. Garrison

REICHHOLD CHEMICAL, INC. 9, 10, 11, 12
White Plains, N. Y.
Surface Coating Resins, Chemical Pigment Colors.

Urich	Knauss	Howell	Hurst
Coerdt	Klug	Drake	Rockenbach
Hafeli	Slootmaker	Pinkerman	Breedlove
Smiles	Wilson	Johnson	Baran

— See Advertisement 2nd Cover —

RHEEM MANUFACTURING COMPANY 28, 29, 30
South Gate, Cal.
Lithographed Drums, Fibre Drums.

A. Nides	A. Godshalk	J. Mitchell	J. McNicholas
C. Emmert	H. Eegan	B. Barriball	H. Altenbern

ROHM & HAAS COMPANY, 55, 56
THE RESINOUS PRODUCTS DIV.
Philadelphia 5, Pa.
Acrylic Resin Emulsion.

K. Alcorn	G. Allyn	M. Bretl	H. Cheetham
G. Clark	M. Collins	W. Gibson	H. Grinsfelder
L. Klein	M. Keyser	W. Prentiss	V. Sheets
N. Timmons	J. Toussaint	J. Urquhart	H. Weiss
J. Weitz	J. Young		

CHARLES ROSS & SON COMPANY, INC. 41
Brooklyn 5, N. Y.
High Speed Three Roll Mills, Double Arm Kneaders, and Mixers.
I Ross C. Ross J. Teleky
— See Advertisement Page 32 —

OSS & ROWE, INC. 90
ew York 4, N. Y.
cithin, Pigment Dispersing Agent.
Schlesinger W. Hilty D. Elliott J. McAuly
— See Advertisement Page 108 —

S

HARPLES CHEMICALS INC. 42
iladelphia 7, Pa.
myl Acetate, Amyl Alcohol, Surface Active Agents.

Eaton	G. Davis	E. Sidoroff	O. Baum
Hoover	T. Baize	M. Binns	

— See Advertisement Page 110 —

BOOTH NO.

SHELL CHEMICAL CORP. 25, 26, 27
New York 20, N. Y.
Odorless Wall Paint Based on Epoxy Resin, High Boiling Ketone (Ethyl Amyl Ketone), Glycerine, Lacquer Solvents.

G. Huldrum	W. Williams	W. Lawery	C. Lee
J. Selden	D. Bradley	W. McCormick	G. Garland
J. O'Connell	J. Robins	M. Ellinson	E. Scogin
F. Swackhamer	J. Cunningham	H. Howard	K. Fitzsimmons

— See Advertisement Page 3 —

SHELL OIL COMPANY 17, 18
New York 20, N. Y.
Petroleum Naphthas, Solvents, Aromatic Solvents, Odorless and Low-Odor Solvents.

T. Shaffer	F. Preu	B. Conn	A. Myers
G. Waters	A. Ferrucci	E. Larson	C. Irwin
J. Gilbert	G. Carnahan	W. Sandheimer	J. Dixon
W. Kingsbury	W. Dey	E. Young	E. Turnan
W. Knapp	W. Albright	D. McHenry	I. Schustek
N. Abernathy	W. Peterson	R. White	W. Pannier
F. Nierhoff	W. Wilmoth	J. Pugh	

— See Advertisement Page 6 —

SHERWIN-WILLIAMS COMPANY 44
Cleveland, Ohio
Co-Fumed Leaded Zinc Oxide Containing Monobasic Lead Sulfate.

C. Adams	C. Case	H. Caywood	O. Clark
P. Darr	G. Goldberg	C. Leamy	J. Stewart
L. Stone	F. Verduin	K. Wilkinson	

SPARKLER MANUFACTURING COMPANY 85
Mundelein, Ill.
Varnish Filters.
Representatives from all Departments.

T

TROY CHEMICAL COMPANY 72
New York 61, N. Y.
Additives and Specialties.
E. Singer M. Sockloff D. Fitzgerald
— See Advertisement Page 103 —

TROY ENGINE & MACHINE COMPANY 80
Troy, Pa.
Angular Mixers and Roller Mills.
J. Parsons E. Brasington R. Stuckless

U

U. S. STONEWARE COMPANY 94
Akron, Ohio
Grinding and Mixing Equipment, Ball Mills, Mill Jars, Grinding Media.
H. Farkas L. Wybel O. Gomoll R. Gross
— See Advertisement Page 77 —

W

T. F. WASHBURN COMPANY 91
Chicago, Ill.
Thixotropic Alkyds.
L. Smith M. Magee R. Fitzsimmons
— See Advertisement Page 75 —

C. K. WILLIAMS & COMPANY 61
East St. Louis, Ill.
Inorganic Pigments and Extenders.

F. Alexander	C. Burris	I. Clare	W. Crumpler
P. Dubbeldeman	E. Green	E. Kroepel	R. Linnett
R. McCarty	A. Mix	S. Richards	R. Stephens
R. Stuebing	A. Thayer		

— See Advertisement Page 98 —

WITCO CHEMICAL COMPANY 54
New York 16, N. Y.
Driers, Metallic Stearates, Carbon Black, Calcium Carbonate.

E. Wagner	R. Wendt	W. Tanner	W. Wishnick
C. Gardner			

— See Advertisement Pages 104, 130 —

NEWS

Pres. Battley Says Paint Sales Break Record in June and July

Record breaking trade sales of paint products during the months of June and July have enabled the industry to overcome early 1954 sales declines and establish a new industry record for the seven month period, according to a recent announcement from Joseph F. Battley, President of the National Paint, Varnish and Lacquer Association.

For the seven month period, ending with July, President Battley stated that industry-wide trade sales to jobbers, dealers, builders, contractors, painters, refinishing shops and direct to the American consumer amounted to $513,604,000. The old record for the corresponding period was in 1953 when trade sales were $513,421,000.

In June of this year a new all-time monthly record was established when trade sales of $85,395,000 were reported, a 3.7% increase over the previous highest month, June of 1953, when trade sales totaled $82,305,000. The demand for paint products conti ued into July when a total of $76,693,000 gave the industry a .5% increase over the record July 1953 sales of $76,312,000.

President Battley pointed out that these two consecutive record setting months in trade sales were positive indications of an upward trend in business and predicted continued good business throughout the remainder of the year. He expressed confidence that total trade sales in 1954 will surpass those of 1953, when the industry experienced its best year in history.

President Battley also pointed out that industrial product finishes sales for the same seven-month period were $306,246,000 compared with $340,884,000 in 1953, a 10.2% decrease. However, overall rising business conditions and introduction this fall of new appliances and products have increased industrial finishes paint sales. Total industry sales are expected to exceed those of 1953.

•

National Aniline Division Opens Office in Los Angeles, California

National Aniline Division, Allied Chemical & Dye Corporation, has announced the opening of a branch office in Los Angeles, California. The office, which has a complete warehouse stock, is located in Vernon, in the heart of the central manufacturing district.

PRINCIPAL SPEAKERS TO BE FEATURED AT NATIONAL ASSOCIATION CONVENTION

A. S. Flemming

H. C. McClellan

L. M. Cherne

The 66th Annual Convention of the National Paint, Varnish and Lacquer Association opens Monday, November 15, at the Palmer House, Chicago. The convention will run for three days.

A feature of the program will be five manufacturers' management forums covering industrial product finishes; trade sales products; advertising and sales promotion; putty, glazing materials and caulking compounds, and roof coatings.

Nationally famous speakers and authorities in their particular fields will address the sessions. Arthur S. Flemming, Director, Office of Defense Mobilization; S. I. Hayakawa, author of "Language in Thought and Action"; Harold "Chad" McClellan, head of the National Association of Manufacturers; and Leo M. Cherne, Executive Director, Research Institute of America are among those scheduled to speak.

Also on tap is a wholesale distributors annual meeting, a full session discussion on efficient warehousing, increasing sales, effective merchandising and other related subjects.

Industrial Research and Services Laboratories Set Up by duPont

Ten new industrial research and service laboratories, costing more than $12,000,000, will be devoted to customer service and product development, according to a company letter from E. I. duPont de Nemours and Company, Inc., to its supervisory employees.

One of the units will be operated by the Pigments Department, which will undertake long-range work aimed at diversification in its present fields of pigment, titanium metal, and silicon. This project was announced last August.

The Pigments Department has a smaller laboratory under construction at Newark, New Jersey, for the development of new colors for paint, ink, paper, plastics, and other products. It is scheduled for completion next year.

A $3,000,000 laboratory for the Polychemicals Department at Chestnut Run is partially occupied and due for completion within the next few months. It represents expanded capacity to provide sales and engineering services to customers in the plastics industry.

Establishment of a new sales service laboratory for the refrigeration and aerosol industries was announced by the Organic Chemical Department last May. Connected with the Jackson Laboratory at Deepwater Point, New Jersey, it was set up to give better service to those industries.

Plant Maintenance & Engineering Show to be Held in Chicago, 1955

The 6th Plant Maintenance & Engineering Show will be held at the International Amphitheatre, Chicago, Jan. 24 to 27, 1955, according to a recent announcement.

The show, which is said to be one of the largest industrial expositions in the country, will be the first such exposition to occupy the new $2,000,000 hall which has been built as an addition to the International Amphitheatre.

The new hall has 18,000 square feet of space, with large exhibit bays of 2,400 square feet unobstructed by columns.

Advance registration cards may be obtained from Clapp & Poliak, Inc., the founders of the event. They are located at 341 Madison Avenue, New York 17, N. Y.

•

Honor E. R. Dondorf, 48 Years With National Lead Company

Ernest R. Dondorf, manager of metal purchases for National Lead Company, was honored at a luncheon given by his associates marking his 48th anniversary as an employee of the company.

Mr. Dondorf started his career with National Lead in 1906 in the office of United Lead Company, a subsidiary, and continued in the metal department of the company in 1928. Mr. Dondorf became manager of metal purchases in 1939.

NEWS

New Polyester Production Unit Starts Operating on Coast

The completion of a new polyester production unit at the Azusa, California, plant of Reichhold Chemicals, Inc., was announced recently by Henry H. Reichhold, chairman of the board.

The unit, which has just begun to produce, has an estimat d capacity of 10,000,000 pounds annually, and has been designed so that additional capacity can be added as needed.

•

H. R. Lyon Returns to Evansville For the Glidden Company

Harold R. Lyon, an industrial finishes expert, has returned to Evansville as sales engineer for the area for the Nubian Industrial Division of The G dden Company.

Glidden's Nubian Division specializes in the production of industrial finishes for large volume users.

Mr. Lyon, an Evansville native, left in 1952 to direct painting operations at the Coshocton, Ohio works of General Electric Company. Last year, he joined the Technical Service organization of Glidden's Nubian Industrial Division at Chicago.

•

Jones & Laughlin to Construct New Container Division

Jones & Laughlin Steel Corporation has announced plans for construction of a new Container Division plant and office. It will be located at West Port Arthur, Texas, on the same property as J&L's present plant.

The equipment now used for producing steel drums will be moved into the new building, which will be about 38,000 square feet in size. The present plant, which has 18,000 square feet of space, will be used as a warehouse.

A new piece of equipment in the plant will be a paint baking oven, which will enable J&L to produce high-bake interior linings for the drums.

•

Prof. Wendel M. Latimer to Get Chemical Society Award

Professor Wendell M. Latimer, University of California chemist, has been awarded the 1955 William H. Nichols Medal of the American Chemical Society's New York Section, according to an announcement by John H. Nair, chairman of the jury of award.

Prof. Latimer is widely known for his important contributions in the fields of atomic energy and chemical warfare.

32nd ANNUAL FEDERATION MEETING TO HEAR LEADING AUTHORITIES

John T. Rettaliata

James S. Long

Rahim Bux-Khan

H. A. Hampton

C. W. Selheimer

J. C. Cowan

The 32nd Annual Meeting of the Federation of Paint and Varnish Production Clubs opens at The Palmer House, Chicago, on Thursday, November 18, and will run for three days.

Highlighting the meeting will be The Joseph J. Mattielo Memorial Lecture and the Keynote Address. Dr. James Scott Long, of Devoe & Raynolds Co., delivering the Mattielo lecture will speak on "Coating Imagination as It Applies to the Decorative and Protective Industry."

The keynote speech will be given by Dr. John T. Rettaliata, president of the Illinois Institute of Technology in Chicago.

Both, Doctors Long and Rettaliata, have been actively engaged in technical education for many years. As far back as 1927 Dr. Long organized a cooperative research agreement between Lehigh University and several interested firms to further study the fundamentals of oil chemistry. He is scheduled to deliver his address at the Friday afternoon session.

Dr. Rettaliata, who will speak at the Thursday afternoon session, received a special certificate of commendation from the Bureau of Ships for his study of steam turbines developed by Germany for hydrogen peroxide submarine.

Among the important papers to be presented are: "Pakistan and the Paint Industry" by Rahim Bux-Khan, of Buxley Paint Works, Karachi, Pakistan. He will speak about the difficulties encountered by that country from its birth as a nation in 1947 up to the present time.

H. A. Hamptom will speak on, "Observations on Some Testing Methods." The paper will discuss newly designed apparatus.

Professor C. W. Selheimer, of the Illinois Institute of Technology, will deliver a paper on, "Fume Control in the Paint and Varnish Industry." The paper will reveal the results of a five year survey project.

Dr. J. C. Cowan will deliver a paper on, "Research Related to Protective Coatings at the Utilization Research Branch."

The 19th Paint Industries Show, opening on Tuesday, and continuing throughout the week, will serve as a tie between the Federation programs and the 66th Annual Convention of the National Paint, Varnish and Lacquer Association which will be held for three days beginning on Monday.

AMSCO Honors Clyde McInnes

Clyde C. McInnes, Chicago Manager of American Mineral Spirits Company's Solvent Extraction Division, was honored at a banquet on Clyde "Mac" McInnes Night commemorating his twenty-fifth anniversary with Amsco. The dinner was a feature of Amsco's Sales Meeting at the Hotel Galvez, Galveston, Texas.

"Mac" was presented with a diamond service award and an inscribed gold watch by A. W. Vallentyne, Chairman of American Mineral Spirits Company.

NEWS

Chemical Institute of Canada Lists Schedule of Meetings

Following is a list of meetings scheduled by The Chemical Institute of Canada:

9th Divisional Conference, the Protective Coatings Division, Royal York Hotel, Toronto. February 24, 1955.

9th Divisional Conference, the Protective Coatings Division, Ritz Carlton Hotel, Montreal. February 25, 1955.

5th Divisional Conference, the Chemical Engineering Division, Ottawa. March 7 to 9, 1955.

6th Canadian High Polymer Forum, sponsored jointly by The Chemical Institute of Canada and the National Research Council, St. Catharines, Ontario. April 14 to 15, 1955.

38th Annual Conference and Exhibition, Quebec City, Quebec. May 30 to 31, June 1, 1955.

Divisional Conference, the Physical Chemistry Division, Montreal. Topic: Nuclear Chemistry. September 8 to 9, 1955.

•

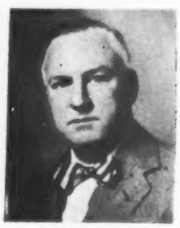
Max Minnig Elected Executive Vice-President of Witco Chemical

Max Minnig has been elected executive vice-president of Witco Chemical Company, New York City. He joined the company's natural gas division in 1946 and has held the posts of national sales manager for rubber chemical, director of sales, and vice-president.

•

Archer-Daniels-Midland Elects Frank Haas to Board of Directors

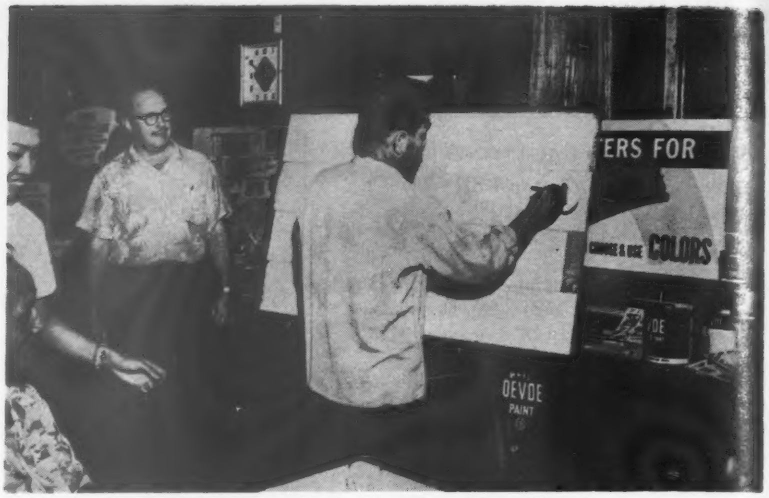
Frank C. Haas has been elected to the board of directors of Archer-Daniels-Midland Company, according to a recent announcement following the firm's annual meeting of stockholders.



F. C. Haas

Haas joined the company in 1929 and was elected a vice president in 1950.

According to Thomas L. Daniels, ADM president, who made the announcement, the chemical products division which Haas heads is expected, in time, to produce higher fatty alcohols to be used in new types of detergents, lubricating greases and scores of other products.



E. C. Bishop (left) Director Pacific Coast Operations at Hawaiian opening.

Devoe & Raynolds to Sell Line Of Paints in Hawaiian Islands

The Devoe & Raynolds Company, Inc., announced the recent appointment of American Factors, Ltd., as distributors for Devoe Paints in the Hawaiian Islands.

The first shipment of Devoe Paint products arrived in Hawaii in mid-August. At the same time an extensive introductory campaign was launched in the territory to aquaint dealers, contractors, architects, engineers, industrial engineers and government representatives with the new line of paints.

Sherwin-Williams Honors 14 Who Have Served Firm for 25 Years

Fourteen men who have been with the Sherwin-Williams Co. for 25 years were honored by the paint firm in connection with a series of regional sales conferences.

Each received a watch and a scroll presented by either President Arthur W. Steudel or Vice President Arthur H. Burt.

Those receiving awards, together with the site of the regional sales conference include:

David O. Brown and Russell A. Caroland, Southeastern Region; T. E. Fancher, Norman S. Nelssen, and Robert W. Kreitser, North Central Region; M. C. Price, J. W. Drummond, and Robert Harter, North Atlantic Region; George L. McConnell, South Atlantic Region; Robert B. Gauley, Harry J. Sherry, and Luther P. Garrison, Western Region; Richard L. Belitzer, Southwestern Region; Milton Swahn, Gulf States Region.

•

Dow Expanding Latex Facilities

Expansion of facilities for latex research and development at its Midland Division was recently announced by The Dow Chemical Company, pioneer in the development of styrene-butadiene latexes for today's popular latex paints, fine paper coatings and other uses.

The new facilities will be under the direction of J. W. Britton, a company production manager.

The expansion program includes a Latex Research Laboratory scheduled for occupancy November 1. It will concentrate on the improvement of present Dow latexes and the development of new latexes for applications in the paint and paper coatings fields as well as other industrial uses.

Two other buildings, expected to be completed early in 1955, will be devoted to latex product development, including latex polymerization and production of latex formulations in amounts suitable for customer evaluation purposes.

Dudley A. Taber, who joined Dow in 1937, will be in charge of the laboratory.

Max L. Bottomley, with the company since 1946, will have charge of the two product development units.

•

Givaudan President Reports European Business Optimistic

E. R. Durrer, president of The Givaudan Corporation and its associate companies, Givaudan-Delawanna, Inc., Givaudan Flavors Inc., and Sindar Corporation, has recently returned from a three-month stay abroad.

Mr. Durrer visited the Givaudan factories in Switzerland and France. He reported that business in Switzerland and in Europe is generally being conducted on a continously high level with none of the fears of a recession which are being felt in the United States.

NEWS

E. J. MacFarlan, Manager of Du Pont's Frisco Plant Retires

Edward J. MacFarlan, manager of the Du Pont Company's finishes plant in South San Francisco, retired on August 31 after 28 years with the company. He was succeeded by Milton L. Byron, who has been assistant plant manager since January, 1953.

A native of Darlington, S. C., Mr. MacFarlan attended Union College, Schenectady, N. Y., receiving the degree of bachelor of science in 1920. He joined Du Pont in 1926 as a supervisor at the Parlin, N. J., finishes plant. He later was assigned to finishes plants in Flint, Mich., and Philadelphia in 1940. He became manager of the Everett, Mass., finishes plant the following year.

In 1942 and 1943 he was special assistant to the production manager of Remington Arms Company, a Du Pont subsidiary, in Bridgeport, Conn. He was assistant to the director of production of Du Pont's Finishes Division in Wilmington, Del., from 1943 to 1947, and then was manager of the Fort Madison, Iowas, finishes plant before coming here as plant manager in October, 1948.

Mr. Byron joined Du Pont in 1926 as a chemist at the Philadelphia plant, later becoming a supervisor there. In 1943 and 1944 he was a chief supervisor at Remington Arms Company's Kings Mills, Ohio, plant. He was named plant superintendent of the Everett plant in 1944, and assistant plant manager of the Toledo, Ohio, finishes plant in 1945, a position he held until he came to South San Francisco in 1953. Mr. Byron was born in Erie, Pa., and attended Cornell University, receiving the degree of bachelor of chemistry in 1924 and that of master of chemistry in 1926.

•

New Color System Claimed By Morris Paint & Varnish Co.

A new color system has been announced by the Morris Paint & Varnish Co. of St. Louis, Missouri.

The company says that it is similar to other color systems only in the fact that it uses 13 simple tube colorants. The specially developed neutral and white tinting bases are called entirely different in that they have extremely solid covering, are completely alkyd, and absolutely odorless.

Leading executives in the paints and chemicals industries who recently held an organizational meeting to map plans for mobilizing industry-wide support for the 1954 Joint Defense Appeal campaign. The JDA is the fund-raising arm of the American Jewish Committee and the Anti-Defamation League of B'nai B'rith. It seeks to raise $5,000,000 nationally to combat bigotry and discrimination and safeguard human rights. The campaign's highlight was a dinner on November 9th, at the Hotel Warwick, New York, according to Lester Arnstein, Arnesto Paint Company, JDA division chairman. Standing, left to right, Richard Hillman, Eagle Paint Company; George Fein, Fein's Tin Can Company; Irving Holtz, National Can Company; Benjamin Farber, Farnow Varnish Company; and Albert Calo, John Calo, Inc. Seated, left to right, David H. Litter, D. H. Litter Company; Mr. Arnstein; and William Wishnick, Witco Chemical Company.

Elect 3 New Board Members At Hercules Powder Company

Three new members were elected to the board of directors of Hercules Powder Company, Wilmington Delaware, at a recent board meeting.

They are: L. W. Babcock, director of personnel; John E. Goodman, treasurer; and Ernest S. Wilson, director of engineering.

Mr. Babcock has been director of personnel since 1945. Prior to that he was responsible for the staffing and training of technical personnel recruited by the company to operate government-owned ordinance plants. He has been with Hercules since 1917.

Mr. Goodman has been treasurer since January 1954. He had been an assistant treasurer of the company since 1951, and prior to that an assistant comptroller since 1946. He joined the company in 1936.

Mr. Wilson became director of engineering in 1947. He joined the company in 1923 and became assistant chief engineer in 1939.

•

Spencer Kellogg to Build New Laboratory in Buffalo

Spencer Kellogg & Sons, Inc., is set to erect new laboratory facilities near the Buffalo Airport after the Cheektowaga Town Board approved rezoning of a 40 acre tract of land hitherto classified residential.

The company plans to construct chemical and physical laboratories and a pilot plant.

Archer-Sigler to Act as National Sales Agents for "Plasticool"

Earl Conley, president of Coating Laboratories of Tulsa, has announced completion of arrangements with the Archer-Sigler Corporation of the same city, to act as national sales agents for Plasticool, a sun-reflective paint.

Jack Archer, president of the new distributing company, said he would directly contact all parties interested in handling regional or state distributorships for the new product.

Interested parties may write to Archer-Sigler Corporation, 315 North Elwood, Tulsa, Oklahoma for complete details.

•

G. R. Lawson to Take Part in Harvard Management Program

George R. Lawson, vice president, sales, of Sharples Chemicals Inc., has been selected to participate in the Advanced Management Program of the Harvard Graduate School of Business Administration, according to an announcement from, L. H. Clark, president.

Mr. Lawson joined Sharples in 1946.

•

"Gus" Schuermann, 51, Dies; With Glidden Co., 27 Years

E. G. "Gus" Schuermann, 51, St. Louis area sales representative for the Chemicals, Pigments and Metals Division of The Glidden Company, died in mid-September.

Mr. Schuermann had been with the company for 27 years. He is survived by his widow and two children.

NEWS

Heyden Chemical to Purchase All Nuodex Outstanding Common Stock

Heyden Chemical Corporation has entered into a contract to acquire all the outstanding common stock of Nuodex Products Company, Inc., according to a joint announcement made by Simon Askin, president of Heyden, and Leo Roon, president of Nuodex.

Nuodex Products Company, Inc., of Elizabeth, New Jersey, is a leading manufacturer of chemical additives for the paint, plastic and other chemical process industries.

According to Mr. Askin, Nuodex will be operated as a separate division of Heyden under its present management, headed up by Arthur Munich as general manager and executive vice president.

Mr. Roon said that, having reached retirement age, he would withdraw from active participation in business.

Nuodex pioneered in the development of certified metal liquid driers for the paint and varnish industry and supplied these industries with fungicides, mixing and milling aids for pigments, loss-of-dry inhibitors and antiskinning and bodying agents.

Heyden's products for the paint and varnish industry include formaldehyde and its derivatives, the pentaerythritols, Monopentek, Dipentek and Tripentek, which are used in large volume in the manufacture of alkyds, drying oils and related products.

•

American Chemical Society Honors Prof. Jonassen of Tulane

Professor Hans B. Jonassen, Tulane University chemist who has made important contributions in the fields of drugs, foods, dyestuffs, agriculture and petroleum through his outstanding researches on complicated electrically charged particles, was given the 1954 Southern Chemist Award of the American Chemical Society's Memphis Section.

The gold medal was presented to Professor Jonassen at a banquet in the Thomas Jefferson Hotel, Birmingham, Ala., on October 22, as a highlight of the Society's three-day Southeastern Regional Meeting, according to an announcement by Dr. Arthur F. Johnson, chairman of the Memphis Section.

Professor Jonassen is now serving as a consultant to the United States Army's Frankford Arsenal and to the Standard Oil Company of New Jersey, and as a collaborator with the United States Department of Agriculture's Southern Regional Research Laboratories.

Panoramic view of proposed Commercial Solvents new plant at Monroe, La.

Commercial Solvents Corp. Builds Nitroparaffin Plant in Louisiana

Commercial Solvents Corporation has awarded the contract for construction of its new large scale nitroparaffin plant to the Ford, Bacon and Davis Construction Corporation of Monroe, Louisiana, it was announced by J. Albert Woods, CSC President.

Construction of the $5,000,000 facility at Sterlington, Louisiana has already started and the new plant, the first major step in the company's nitroparaffin expansion program, is expected to go on stream August, 1955.

The company is presently producing and marketing limited quantities of nitroparaffins and derivatives, which have already achieved a wide range of applications in chemical and chemical process industries.

In addition to the new construction, the company's existing nitroparaffin derivatives facilities at Peoria, Illinois will be enlarged.

N. Dakota Agricultural College Received $6350 in Grants

The School of Chemical Technology, at the North Dakota Agricultural College, Fargo, North Dakota, has received additional research and fellowship grants totaling $6350.00, according to Dr. R. E. Dunbar, Dean.

The latest award of $4800.00 has been provided by Spencer Kellogg and Sons, Inc., Buffalo, New York. It will be paid over a period of four years, to subsidize the research activities of a graduate student working in the field of drying oil technology. In addition, one or two senior students, at the discretion of Dean Dunbar, may be awarded $300.00 to $450.00 annually to help defray college expenses. Candidates must be in the upper third of their class, in need of financial assistance, research minded and of high moral character.

The Archer-Daniels-Midland Co., of Minneapolis, Minnesota, has renewed their two grants of $1250.00 for the current school year. The graduate award in chemistry provides $750.00 to a student of organic chemistry or paint technology and is based on high scholarship, well balanced personality and financial need. The senior award of $500.00 is given to a male student in the upper half of his class scholastically, of excellent character, well balanced personality and in need of financial assistance.

The Glidden Company of Cleveland, Ohio, again provides three $100.00 scholarships, based on scholarship, character and financial need, to entering freshmen.

•

Chicago Exposition Designed to Attract Quality Audience

The 9th annual National Industrial Packaging and Materials Handling Exposition, staged at the Chicago Coliseum, September 27 to 30, was comprised of three features: Exposition, National Protective Packaging and Materials Handling Competition, and the Packaging and Materials Handling Competition. They were designed to attract a quality audience.

Toward this end, the directors of the Society of Industrial Packaging and Materials Handling Engineers, sponsors of the triple-feature event, dispensed with the "open house" day to which the public had in the past been invited.

This appeal of selectivity to industry was indicated by the large number of participants in the Short Course, which was co-sponsored by the University of Illinois.

NEWS

Comprehensive Research Program Urged for Drying-Oil Industry

A comprehensive program of fundamental research is vital to the growth of the drying-oil industry's markets in paint, varnish, and other products that use drying oils.

This thought keynoted a recent talk presented to a meeting of the American Oil Chemists' Society at the Hotel Radisson in Minneapolis.

Dr. Odin Wilhelmy, Jr., and Mr. Harry W. Barr, Jr., Battelle Institute, outlined the results of a year's study financed by the U. S. Department of Agriculture at the Columbus, Ohio research center. The complete report will be published at a later date by the U. S. Department of Agriculture.

The study, conducted on an industry- and country-wide interview basis, sought to analyze the shrinking markets for inedible fats and oils in drying-oil products, and to make recommendations on how these markets could be recovered or expanded.

Wilhelmy said the proposed research effort should include a thorough investigation of the basic chemistry of drying oils. This would provide a starting point for research in the chemical modification of the oils. From resulting modifications, new products could be developed that will serve more effectively as raw materials in established uses, or that will find entirely new uses. The program should also include studies of the mechanism of film formation, the factors that affect color retention in protective coatings, and the possibilities of developing improved strains of plants from which drying oils are made.

Essential to this research effort, Wilhelmy emphasized, is increased recognition of the potential value of drying oils as basic chemical raw materials.

In recent years, synthetic materials and tall oil have been consumed in increasing amounts by the processing industries that use agriculturally based drying oils in making paints, varnish, lacquer, and coverings for floors, walls, and tables. In most cases, it was explained, these shifts occurred because the end products made from the new formulations had superior properties, or offered equally good properties at less raw materials cost.

Harry Wood, third from left, shown receiving a sterling silver heirloom dish from Arthur Dooe, Jr., president of the Hooker Glass & Paint Manufacturing Company, on the occassion of ceremonies marking Wood's retirement from the company after 55 years of service. Company executives at the ceremony are, left to right, George W. Lerch, purchasing agent; B. W. Kunst, advertising manager; Mr. Wood; Mr. Dooe; Andrew A. Mazurek, vice president; and L. J. Kleisner, manager of the wallpaper department.

Sales Office in Houston, Texas Opened by National Lead Company

Titanium Pigment Corporation of National Lead Company has announced the opening of a new sales office in Houston, Texas. The new office will bring added service in the sale of "Titanox" pigments to Texas and adjacent states.

H. M. Henly

The office is headed by H. M. Henly, who was formerly in charge of the company's Pittsburgh office. Mr. Henly joined the firm in 1940 at their plant in New Jersey. In 1947 he was transferred to Titanium Pigment Corporation in a sales capacity.

•

Tall Oil Association to Award Prizes for Original Papers

The Tall Oil Association has announced a contest designed to recognize outstanding unpublished papers and research work by persons working on tall oil and tall oil products.

According to the Association's president, Albert Scharwachter of Arizona Chemical Company, the three best papers will be awarded $500, $250, and $100 respectively.

The work is to be judged on its originality and technical merit, not on its value as literature.

Explanation and entry blanks may be obtained by writing to Awards Committee, Tall Oil Association, 122 East 42nd Street, New York 17, N.Y.

O'Brien Corporation Acquires Garrett M. Goldberg Paint Co.

Jerome J. Crowley, Jr., president of the O'Brien Corporation, has announced acquisition of the Garrett M. Goldberg Paint Company of San Francisco, California.

The transaction provides O'Brien with facilities for the manufacture and distribution of paint to all parts of the country for the first time in the 79-year history of the company.

William D. Lewis, who has been appointed general manager, stated that the complete Goldberg paint line will continue to be manufactured and distributed to all existing customers. He added that leading items in the O'Brien line will gradually be introduced to West Coast dealers as soon as production schedules allow.

Garrett M. Goldberg, retiring owner, founded the company in 1906. He is a brother of "Rube" Goldberg, the cartoonist.

This marks the third major extension of the O'Brien Corporation in the past seven years. In 1948 a plant was purchased in Baltimore, Maryland. In 1953 the Eagle-Picher Company's paint plant in Oklahoma City was acquired.

•

American Chemical Society Holds Southeastern Meeting

Five hundred chemists and chemical engineers from all parts of the country met in Birmingham, October 21, for the 1954 Southeastern Regional Meeting of the American Chemical Society.

The Society's president-elect is Professor Joel H. Hildebrand of the University of California.

Schenectady "custom-made" resins give you a better product!

Why try to fit a stock resin into your production picture when it's so easy to get a special one that meets ALL your requirements? Schenectady Resins—phenolic, terpene, alkyd, epon, silicone, maleic, resorcinol—in liquid, lump or powdered form—are being developed regularly for such products as paint, varnish, floor coverings, adhesives, inks, grinding wheels, brake linings, rubber products, foundry shell molds, laminates, etc. If you are currently using resins in your production, it will pay you to check with Schenectady.

SCHENECTADY RESINS (Div. of Schenectady Varnish Co.)
200 Congress St., Schenectady 1, N. Y.
West Coast:
R. E. Flatow & Co., 1525 Powell St., Oakland 8, Calif.
IN CANADA: Paisley Products of Canada, Ltd., Sta. H, Toronto, Can.
EXPORT DISTRIBUTORS: Binney & Smith International, Inc., New York 17, N. Y.

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424 Bowen Building,
Washington, D. C.

Complete copies of any pattents or trade-mark registration reported below may be obtained by sending 50c for each copy desired to Lancaster, Allwine & Rommel.

Nitrocellulose Film

U. S. Patent 2,689,187. Soren M. Thomsen, Pennington, N. J., assignor to Radio Corporation of America, a corporation of Delaware.

A film-spreading composition consisting essentially of nitrocellulose and liquid in which said nitrocellulose constitutes not more than about 20% by weight and said liquid constitutes the remainder and in which the liquid consists essentially of (1) a substantially non-volatile, water-insoluble plasticizer for said nitrocellulose, present in an amount of about 1/10 to ½ the weight of said nitrocellulose, (2) of substantially water-insoluble solvent selected from the class consisting of octyl acetate, ethyl buty acetate and ethyl amyl acetate in an amount equal to about 2 to 4 times the weight of the nitrocellulose, and (3) a solvent selected from the class consisting of ethyl acetate, cyclohexanone and methyl isobutyl ketone constituting the remainder.

A film-spreading composition consisting essentially in per cent by weight of nitrocellulose 10%, dioctyl phthalate 2.5%, octyl acetate 27.5%, and mesityl oxide 60%.

Removing Paints

U. S. Patent 2,689,198. John S. Judd, Birmingham, Mich., assignor to Lyon, Incorporated, Detroit, Michigan, a corporation of Michigan.

The method of removing paint from a painted object which comprises immersing said object in a body of cold liquid paint solvent, spraying the object with cold liquid paint solvent in a spraying zone, passing the sprayed object into a second liquid body of cold paint solvent, passing the object from said second body into a vapor zone, contacting said object with heated vapors of said solvent in said vapor zone to heat said object, and passing the heated object into a cooling zone to condense vapors from said vapor zone.

Coating Polyethylene

U. S. Patent 2,689,197. Hans Gerlich, Mannheim, Germany, assignor to Badische Anilin- & Soda-Fabrik Aktiengesellschaft, Ludwigshafen am Rhein, Germany.

A process for the production of well-adhering coatings on the surface of polyethylene articles which comprises applying thereto a solution containing a member of the group consisting of polyvinyl chloride and an interpolymer of a major proportion of vinyl chloride with a minor proportion of a member of the group consisting of vinyl esters, and a plasticized alkyd resin and drying the applied coating.

Fungi and Bacteria-Resistant Polymers

U. S. Patent 2,689,838. Joseph R. Darby, Richmond Heights, and Elmer E. Cowell, St. Louis, Mo., assignors to Monsanto Chemical Company, St. Louis, Mo., a corporation of Delaware.

A process for preparing fungi and bacteria resistant vinyl halide-containing polymeric compositions which comprises incorporating into a vinyl halide-containing polymer in which more than 50% by weight is made from a vinyl halide a substantially homogeneous composition obtained by heating a mixture comprising a plasticizer for said resin, the condensation product of toluene-sulfonamide and formaldehyde and a minor but effective amount of copper 8-quinolinolate, the amount of the condensation product of toluene-sulfonamide and formaldehyde being sufficient to compatibilize the copper 8-quinolinolate in the resin composition.

Polymeric Compositions

U. S. Patent 2,683,128. Gaetano F. D'Alelio, Pittsburgh, Pa., assignor to Koppers Company, Inc., a corporation of Delaware.

A composition of matter comprising polymeric acrylonitrile containing in the polymer molecule at least 80% by weight of acrylonitrile, and a substituted urea of the formula

$$(CH_3)_2NCONRR',$$

wherin R and R' are alkyl groups of less than four carbon atoms.

NEW MATERIALS & EQUIPMENT

A MONTHLY MARKET SURVEY

This section is intended to keep our readers informed of new materials and equipment. While every effort is made to include only reputable products, their presence here does not constitute an official endorsement.

ETHYLENE CYANOHYDRIN

Intermediate

Ethylene Cyanohydrin is said to be a highly reactive intermediate that undergoes the reactions of both primary alcohol and an aliphatic nitrile. According to the manufacturer, this chemical is important in the synthesis of acrylonitrile, polyacrylic acids, polyacrylates and other acrylic derivatives; used as a solvent in the manufacture of cellulose esters; effective inhibitor and color stabilizer in the polymerization of acrylonitrile.

Carbide and Carbon Chemicals Co., Div. of Union Carbide and Carbon Corp., 30 E. 42nd St. New York 17, N. Y.

PLASTICIZER

For Plastisols and Organosols

"Elastex" 40-P is recommended as a plasticizer for plastisols and organosols. According to the manufacturer, this plasticizer is a low-cost material and is intended for producers interested in reducing costs without affecting quality.

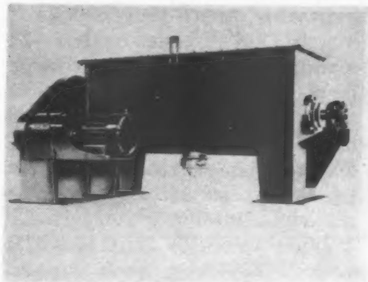
Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.

DESENSITIZING CHEMICAL

May Be Added to Paint

Chemical is claimed to have desensitizing properties and can be added to paint products. According to the manufacturer, this chemical makes any room allergy-free. Recommended quantities: 1% based on the paint. Available on a franchise agreement.

For complete details, write to Philips Scientific Laboratories, P.O. Box 152, Arlington, N. J.



STEVENSON

RIBBON MIXER

Horizontal Type

Horizontal type ribbon mixer is designed for blending of wet or dry materials, according to the manufacturer.

Available in sizes for working volumer from ¼ to 175 cubic ft., the new models are said to feature extra heavy one piece end plate construction, and oversized shaft and heavy duty anti-friction roller bearings.

Other features claimed are: large seal glands with more than adequate packing for either dust or liquid applications are used; ribbon shaft is flange coupled within the tub to facilitate removal; drive is drip proof by totally-enclosed or explosion proof motor, gear reducer and chain drive mounted on an integral base; equipped with either center or end non-clogging discharge valve.

The Stevenson Co. 225 N. Wilkinson St., Dayton, Ohio.

COPOLYMER RESIN

For Interior Whites

The development of Cycopol 340-18 is said to represent a new approach to the formulation of architectural white enamels having excellent flow, color, and gloss.

Characteristics of this vehicle claimed by the producer are: high gloss and gloss retention, even under high humidity; good color and color retention, with minimum color contrast between masked and exposed films; high solids and high refractive index, giving unusual film depth and fullness; and infinite solubility in aliphatic hydrocarbon solvents.

This resin is compatible with oils, varnishes and alkyd resins; completely compatible with "Q" bodied linseed oil and is also compatible with oil modified alkyd resins, depending on the oil content and the degree of polymerization.

This resin is reported to exhibit good stability with the commonly used pigments. Zinc oxide can be used without danger of bodying or seeding of enamels during prolonged storage. Pigment dispersions can be made on roller or pebble mills employing the same techniques as with long oil alkyd resins.

For complete details contact the American Cyanamid Co., Plastics & Resin Div., 30 Rockefeller Plaza, New York, N. Y.

MYCRENE

Polymerizes in Emulsion

Mycrene-85, a terpene product, is closely related chemically to geraniol, nerol and certain other alcohols.

According to the producer, this product is adaptable for the synthesis of aromatic-type materials and a general line of chemicals. It will also polymerize in emulsion with peroxide catalyst to produce a rubber-like latex. It may be copolymerized with such compounds as styrene, methyl styrene, ethyl acrylate, and acrylonitrile.

The product is a refined grade of the material running 75 percent mycrene. The balance is composed primarily of 1-limonene together with the chemical's polymers and small quantities of unreacted beta pinene. Available in drum and tank car quantities.

For samples and technical data, write to E. W. Colledge, G. S. A. Inc., at Jacksonville, Fla., New York, N. Y., and Chicago, Ill. or to The Glidden Company's Naval Store Div., P. O. Box 389, Jacksonville, Fla.

NEW MATERIALS — EQUIPMENT

IRON OXIDE PIGMENTS

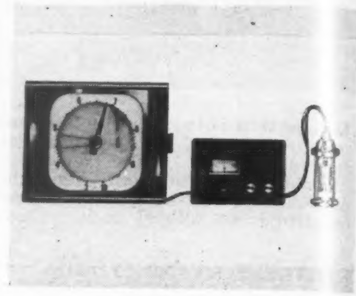
Two Types

Mapico Tan 15, bright tan color, is said to have the following properties: fine particle size, bright color reflectance, exceptional softness, easy dispersion, heat stable (can be used where high baking schedules are required and where service requirements necessitate stability to high temperatures over long periods), light-fast, non-bleeding, and resistant to attack by alkalis and acids.

Useful in high gloss and semi-gloss enamels and flat paints. This pigment has an oil absorption of 31-35 lbs. of oil to 100 lbs. of pigment. It is compatible with whites and other pigments making it an ideal coloring agent for a wide range of tints or in combination with other colors.

Mapico Brown 422, the second color, extends still further the Mapico Brown series. It is lighter than the others and is approximately 98% ferric oxide. The manufacturer claims that this pigment is lighter than other browns and is approximately 98% ferric oxide. Browns made with 422 are said to be rich in color and have excellent shelf stability over long periods. Specific gravity is 4.70; bulking value for 1 lb. is 0.02554 gallons and weight per gallon is 39.15.

Columbian Carbon Co., 380 Madison Ave., New York, N. Y. Distributor: Binney & Smith, Inc.



BRISTOL

pH INSTRUMENT

Complete System

Complete systems for pH recording and control incorporates the Beckman Model W amplifier. These systems also include the company's electronic potentiometer recorder or controller, electrode assemblies in either flow or immersion types, and a variety of final control elements for the addition of gaseous, liquid, solid or slurried reagents.

For complete information on this pH system, write to The Bristol Co., Waterbury 20, Conn.

CATALYST SPRAY GUN

Wide Usage

Designed to simultaneously spray resin and catalyst, this catalyst spray gun is claimed by the manufacturer to insure uniform mixture of resin and catalyst.

The operation of this unit consists of feeding the resin to the gun through the fluid line and the catalyst is introduced through the air stream. The gun has one head. When the gun trigger is actuated, catalyst and resin meet outside of the air cap and are atomized uniformly so the correct amount is applied to the surface being sprayed.

To assure a uniform mixture, the gun is equipped with a single pressure control for the resin and a double pressure control for the catalyst which is the governing agent in setting the resin. Dual atomizing air pressure is also provided to insure uniform results regardless of main line pressure

variations, according to the manufacturer.

A spokesman of the company said that this gun is expected to speed resin development and formulations which have been retarded because proper application equipment was lacking.

The DeVilbiss Co., 300 Phillips Ave., Toledo 1, Ohio.

BARRETT-CRAVENS

LIFT TRUCK

Battery-Powered

The movement of more materials per man is the aim of this Barrett Riding Type Power Ox. The operator of this unit stands—permitting instantaneous mounting and dismounting, which tends to speed up movements of goods and materials.

Located in the steering handle are forward and reverse push button controls, and dual trigger hand-operated brake controls for operation with either hand.

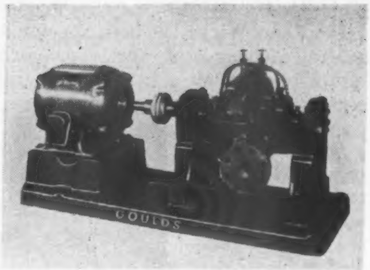
Unit lifts and travels electrically. It has speed up to 6 miles per hour with no load and 3½ miles with load. Both the Power Ox and Pallet Ox are built in standard capacities of 4000-6000 pounds.

Barrett-Cravens Co., 628 Dundee Rd., Northbrook, Ill.

TWO-STAGE PUMP

For Clears

Two-stage pumps for handling clear liquids are available in 5 sizes, providing heads up to 1,000



GOULDS

ft., and capacities up to 1,000 GPM.

Known as the Fig. 3305 line, these pumps were designed with special attention to operating efficiency and ease of maintenance. According to the manufacturer, the casing is horizontially split and the interior can be inspected, and the rotating parts can be removed and replaced without disturbing piping connections. Other features claimed by the manufacturer are: bearing spans have been kept short, resulting in a space saving of as much as 50% in pumps of equivalent head and capacity.; wide interchangeability of parts has been provided, so that spare parts inventories can be kept at a minimum.

Goulds Pumps, Inc., Seneca Falls, N. Y.

Personnel Changes

COLUMBIA-SOUTHERN

Arthur M. Brooks has joined the market research and development department. He has been associated with the Raffold Process Corporation since 1922 and has served as vice president of that firm during the past 24 years. He has specialized in the field of industrial chemistry and chemical engineering, particularly as applied to the pigment and paper industries and in the fields of casein manufacture and leather finishes.

INTERCHEMICAL

Dr. Zeno Wicks has been appointed general manager of the company's central research laboratories in New York, according to a recent announcement. He will be responsible for the administration of the research handled at his location. He is a graduate of Oberlin College and received his doctorate from the University of Illinois in 1944, the same year he joined the company. His most recent position was manager of the commercial research division.

Zeno Wicks

BARRETT

Julian S. Pruitt has been assigned to the Detroit territory. He had previously served as sales representative in southern New Jersey. **Evan E. Senick** had been transferred to the southern New Jersey territory replacing Pruitt. He had previously served as sales representative in the company's mid-Atlantic territory, with headquarters in Richmond. **Lorne C. Stocker**, who recently joined the sales department will replace him in the mid-Atlantic territory.

GOODYEAR TIRE & RUBBER

Eugene F. Gibbons has joined the sales promotion staff of the company's Chemical Division. He will handle sales promotion activities including technical writing on the expanded line of chemical raw materials the division is now producing. A graduate of Cleveland College of Western Reserve University, he is currently publicity chairman of the Machine Design Division of the Cleveland Engineering Society. Earlier this year he served as vice chairman of the publicity committee of the Society's Building and Development Campaign Fund for a new Cleveland Engineering Center.

E. F. Gibbons

BLACKMER

Richard L. White has been promoted to manager of the company's Philadelphia office. He had been division engineer in the New York division prior to his new assignment.

DIAMOND ALKALI

Steve Puschaver, J. R. Horacek, and **John W. Whittleman,** were recently appointed to top positions in the company's Muscle Shoals, Alabama, plant, according to an announcement from A. H. Ingley, vice-president manufacturing. Puschaver became plant manager. He was transferred from the company's Ohio plant where he was general superintendent of the chlorine section. Horacek was also transferred from the Ohio plant where he had been superintendent of power. Whittleman was transferred from the company's Houston Deer Park Plant where he had been a staff assistant in personnel.

GENERAL PAINT

W. L. Watkins has been appointed assistant to R. B. Robinette, president, according to an announcement from his office.

GREAT WESTERN

Robert C. Briscoe has been appointed technical director it was announced by Fred N. Redheffer, president. He joined the company in 1941 and became assistant technical director in 1953. He will now be responsible for product formulation, testing and quality control of products, and supervision of the laboratory and technical staffs. **Robert L. Leeper,** who has been with the company since 1946, has been elected president of the Optimists Club in Kansas City. He is vice-president and treasurer of Great Western.

Robert C. Briscoe

UNITED STATES GYPSUM

W. W. Henkel, W. F. Moran and **K. J. Jalbert** have been named district sales managers. Henkel will manage the southeast paint district with headquarters in Atlanta. Moran, who will manage the mid-east district, will have his headquarters in Pittsburgh. Jalbert fills a new position and will function from the company's Chicago office.

KRYLON

Donald K. Baxter has been named sales manager according to an announcement from James W. Bampton, president of the company. He will supervise the sales activities of the company's 29 representatives from coast to coast.

SHARPLES CHEMICALS

Melbourne P. Binns has been named senior salesman for the St. Louis territory. In this capacity he will handle the company's line of synthetic organic chemicals and specialties including, alcohols, esters, alkyl phenols, amines, rubber chemicals and fuel gas odorants. **John W. Conyers,** Jr., has been transferred from the sales department to the market development department in the company's executive offices in Philadelphia. His activities will include market research activities, introduction of new products, and field work incident to market development. Replacing Mr. Conyers as sales analyst will be **John R. Pfann,** who had been sales assistant.

FREEMAN CHEMICAL

Ralph R. Renzel has been appointed sales manager. He was formerly district sales manager for Plaskon Resins, Barrett Division Allied Chemical and Dye Corporation in Chicago.

HOOKER

Thomas Rhines has been appointed paint and glass representative for the Wisconsin territory. He will make his headquarters in the firm's Milwaukee branch office. **William C. Hicks** becomes manager of the company's Sioux City, Iowa branch. **Sam Francis** succeeds Mr. Hicks in the Chicago sales territory. **Dean Bess** will manager the glazing contract department in the Milwaukee branch under the supervision of T. A. Andeway. **Don Goyer** will serve as manager of the glazing contract department in Decatur.

NATIONAL LEAD

William H. Kehoe has been appointed trade sales manager of the company's Atlantic branch. He was formerly with the Sherwin-Williams Company and Modene Paint Company.

MINNEAPOLIS-HONEYWELL

F. M. Thuney has been named manager of the contract division of the company's industrial division plant at Philadelphia. **J. W. Bowers** will head a newly-created department of service and repair of controls for commercial establishments. He will make his headquarters in Minneapolis. **Harry E. Grossman** was named manager of the firm's Washington branch and **Joseph H. Nixon** will head the Grand Rapids district office. Other new managers include **Wayne F. Kelly,** in the Spokane, Washington, branch; **T. S. Bolling** to the Charleston, West Virginia, office, and **Charles W. Prey** to head the Harrisburg district office. **Leight M. Johnson** has been appointed branch commercial sales manager in Harrisburg and **Raymond A. Metz** to a similar post in Philadelphia.

HILTON-DAVIS

Robert K. Johnson has been named director of analytical laboratories it was announced by James F. Thompson, general manager. He will be in charge of all chemical analysis work involved in the research and development of dyestuffs, pigments, intermediates and certified colors. He will also supervise the quality control program for the company's special laboratories serving the printing ink, protective coatings and textile industries.

GAR WOOD

Leif Unstad has been appointed manager of the company's Minneapolis direct factory truck equipment sales branch, according to an announcement from E. B Hill, vice president.

ARCHER-DANIELS-MIDLAND

James A. Mills has been appointed to a technical sales capacity it was announced by James W. Moore, general sales manager of the company. He was formerly a senior paint chemist engaged in the formulation of industrial and general purpose paints. In his new capacity he will provide technical assistance and sales service to paint manufacturers through most of the south. His headquarters will be in Atlanta.

HERCULES

Edwin S. Ladley has been appointed director of purchases. He joined the company in 1942 and became assistant director of purchases in 1951. He will succeed Lawrence J. Finnan, Jr., who will retire at the end of the year upon completion of 40 years of service.

JOSEPH DIXON

L. P. Kahler has been appointed product manager, paint sales division, according to a recent announcement from H. E. Ehlers, industrial sales manager. He had previously been with the organization for 18 years, and resumes his position after less than a year's absence. He will continue to expand the Dixon Distributor Program which he inaugurated about three years ago. Under this program the distribution of paints and enamel is almost exclusively done through distributors. The program has met with success in the East and it is planned by the company to expand it throughout the country.

L. P. Kahler

AMERICAN CAN

W. S. Beard has been appointed assistant manager of sales, Atlantic division. He had been commodity manager, Central division, being succeeded there by **C. W. Curry. Alaxander Black,** commodity manager, Pacific division, has been named assistant manager of sales, Pacific division, succeeding Mr. Curry. **Donald Poinier** has been appointed commodity manager in the firm's general sales department in New York. Succeeding him is **A. L. Christensen. B. B. Ressler,** will succeed Mr. Christensen as sales manager, North Jersey district.. He was formerly in the New York office.

RESEARCH INSTITUTE

Dr. John T. Goodwin has been appointed manager of the chemistry research division of the Midwest Research Bureau, it was announced recently by Dr. Charles N. Kimball, president. He has been closely associated with the development of silicones, a group of synthetic materials widely used in lubricants, synthetic rubbers, polishes and other similar products. He is the holder of more than 40 patents dealing with methods of manufacturing of organosilicon compounds and alkyd resins, materials used in the production of a great variety of paints, varnishes, plastics, and rubber products.

MONSANTO

Paul H. McConnell has been named district manager of the San Francisco plant, according to a recent announcement from Roy L. Brandenburger, vice president.

WITCO

Charles Gardner has been appointed sales manager, Drier Division. He has been associated with the paint industry for 18 years and, until recently, was Eastern Sales Manager, Technical Sales and Service, Advance Solvents & Chemical Corp., and Technical Director, Advance International, Ltd. He is a member of the New York and New England Paint, Varnish, and Lacquer Associations; American Chemical Society; and American Arbitration Association. He is a Fellow of the American Institute of Chemists.

Charles Gardner

W. F. George has joined the company as special assistant to the president. He was, until recently, district sales manager for the Hooker Electrochemical Company. Well known in the chemical industry he organized and conducted W. F. George Chemicals, Inc., and later was co-publisher of "Chemical Industries", now known as "Chemical Week."

BLACKMER

John D. Fansler has joined the company as manager of its North Central Division.

SHARPLES

Bradlee V. B. Postell has been named assistant to Dr. Howard I. Cramer, vice president, development. He will assist in staff activities incident to the company's development program.

GARLAND

Everett D. Shipman has been appointed vice-president, industrial maintenance sales. He will work in the solving and servicing of complex maintenance problems constantly arising in the country's industries. A graduate of Williams College, he began his business career in 1933. He has been associated with Devoe & Raynolds Co. and the Paint Division of the National Gypsum Co. In conjunction with this work he has written several articles in trade journals on color and wall construction, and has developed helpful educational material for users of protective coatings.

E. D. Shipman

U. S. GYPSUM

M. A. Cobe has been named district sales manager for the New York district, according to an announcement from O. C. White, dealer sales manager of the North Atlantic region. This is a new district recently set up as part of the current reorganization of the company's expanding paint division He joined the company as paint salesman for the Long Island district in 1949, and was made product sales manager in 1953.

PPG

Frank L. Davey has been named industrial sales representative for the Newark Paint Division. Prior to joining the company he was associated with the Egyptian Lacquer Mfg. Co., of Newark, N. J.

BAKELITE

Roger A. Calsibet has been appointed manager, surface coatings materials division, according to an announcement from C. W. Blount, Vice-president in charge of sales for this division of Union Carbide & Carbon Corporation. He succeeds C. W. Patton, and will be responsible for the sales of all Bakelite Company's materials for coatings and vinyl products for adhesives. He was formerly assistant to the manager of the surface coatings division, and joined the company in 1940, following his graduation from Princeton University.

R. A. Calsibet

CELLULOSICS

(*From page 50*)

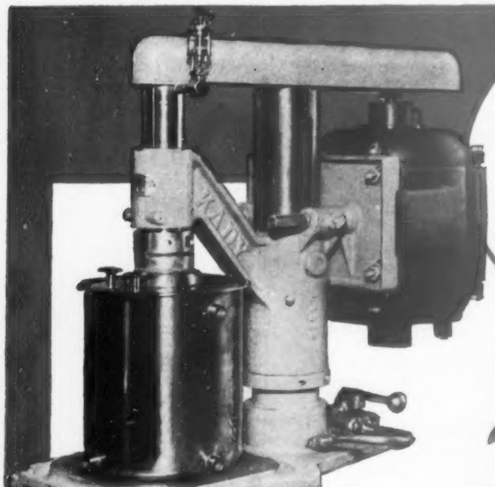
Trade Name	Kauri Butanol Value (cc)	Solvency for 5% EHEC—Low: As received	Solvency for 5% EHEC—Low: Solvent + 8% of 99% isopropanol
Amsco Special Extraction Solvent	37-39	hazy solution	clear solution
Arosol #10	60	clear solution	clear solution
Heptane	35.5	slightly swollen	clear solution
Sovasol #5	33.6	insoluble	clear solution
Varsol 2	44	slightly swollen	clear solution
VM & P naphtha	40-45	slightly swollen	clear solution

Ethanol and butanol also function as cosolvents, but methanol does not. As little as 4% alcohol often converts an aliphatic into an EHEC solvent. While Kauri Butanol values of solvents may be used as a rough guide to their solvency for EHEC, it is by no means a positive thing. Each solvent contemplated should be evaluated.

Compatibility with resins and plasticizers has been carefully catalogued and it is not significantly different from that of ethyl cellulose.

One Coat Texture and Multicolor Finishes

For many years both the protective coating industry and the public which it serves have been intrigued by the thought of a polka-dot or multicolored finish which could be applied in one coat. In spite of multitudinous attempts, such a finish did not become a reality until April 1952. At that time a patent U. S. 2,591,904 was issued which covered a multicolored textured finish that might well be called a "glorified polka-dot or color-flecked finish." Licenses under this patent are currently available from Coloramic Coatings Inc., 6231 South Manhattan Place, Los Angeles 47, California.



Finishes described by this patent (U. S. 2,591,904) are two-phase systems, similar to an emulsion. One phase may be aqueous and the other nonaqueous. But there the similarity ends. In the multicolored finishes described in this patent, the particle size of the dispersed phase can be varied from discrete particle 50 microns to 2500 microns in size, large enough to be visible to the naked eye both in the dispersion and after application. When properly applied, the appearance is essentially the same as in the wet state. Advantages of such finishes are as follows:

(1) Permit application to various types of surfaces to produce, by a single application, multicolor finishes in which the different colors remain distinguishable to the naked eye; (2) can be applied to porous as well as nonporous surfaces; (3) permits application of heavy coatings in a single treatment. While 2 mils approaches a maximum for conventional coatings, 5 mils of multicolor finish is easily obtained; (4 can be applied to dissimilar materials without having them show; (5) permits the spray application of high solids; (6) permit application to damp as well as dry surfaces when water is the continuous phase.

Ethyl Hydroxyethyl Cellulose

The happy combination of lacquer dry times, cellulosic toughness, and solvent systems as lean as 92% hexane—8% isopropanol—has finally been achieved in EHEC. It is a mixed ether of cellulose with a relatively low (about 0.4 substituent groups per cellulose unit) hydroxyethyl substitution and a relatively high (about 2.8 substituent groups per cellulose unit ethoxyl substitution. Most of its properties are similar to those of ethyl cellulose. However, in the field of solubility the differences pay off. Chart I above depicts some of its unique solubility characteristics.

News of Paint and Varnish Production Club Meetings

N W YORK

S. A. Khan and William Greco

Stramim Alam Khan, 24, was guest of honor at the last meeting of the New York Paint and Varnish Production club. He is the son of Rahim Bux Khan, president of the All Pakistan Paint Mfrs. Ass'n.

Stramim Khan is visiting this country to study paints, machinery, equipment and production methods. He is one of the directors of Buxly Paints, Ltd. in Karachi.

He expects to spend the next two years in this country and will be associated with Bob Carlisle, president of R. L. Carlisle Chemical and Manufacturing Company, Inc., Brooklyn, N. Y.

The meeting was under the supervision of Tony Skett, chairman of the technical committee. It reviewed the work of the technical committee and also a complete report of the two papers to be given at the Chicago Convention of the Federation of Paint and Varnish Production Clubs, November 18-20, 1954. The titles of these papers are as follows:

"A Study of Pigment Dispersion" Part 5—Behavior of Toluidine Red— R. L. Whitney, Chairman, Sub-Committee #53

"The Significance of the Tack Free est" S. H. Richardson, Chairman, ub-Committee #37

In addition, three minute reports ere made by following committees: ub-Committee #40—"Methods of Meaaring the Dry Hiding Power of Paints" A. Melsheimer, chairman. Subommittee #44—"Emulsion Paints" E. Spector, chairman. Sub-Comittee #58—"Standards and Methods Test" Frederick M. Damitz, chairan. Sub-Committee #62—"Flat Wall ain.s—Stain Removal and Washabil-y" Herbert E. Hillman, chairman. ub-Committee #64—"Interior Sub-Strats and Preparation for Painting" Sidney B. Levinson, chairman. Sub-Committee #65—"Test Methods for Evaluating the Dispersing Properties" of Vehicles" Moe Bauman, chairman. Sub-Committee #66—"Solvents" E. G. Shur, chairman. Sub-Committee #67 —"Matching Color in Production" S. Leonard Davidson, chairman. Sub-Committee #68—"Effect of Ultra-Violet on Properties of Nitrocellulose Lacquer Films" Royal A. Brown, chairman. Sub-Committee #69—"Literature and Discussion—Topic for Discussion Meeting" George S. Cook, chairman.

LOUISVILLE

The meeting was held on September 15th at the Seelbach Hotel, 54 members and guests attending.

Charles Smith of the Kurfees Company reported for the technical committee.

Clarence Greenwell of the Wolfe Company reported for the membership committee the names of; Robert Burns of U. S. Plywood Company and William S. Schubert of Louisville Varnish Co.

A. E. Stauderman of the Schaefer Company reported that the Club minutes 1917-1935 inclusive had been bound. Amusing excerpts of old minutes were read from the volume.

The motion was carried that Mr. W. Slack of Kentucky Color would consult with the dean of the University of

(*Turn to page 110*)

NEWS

1955 FATIPEC Convention To Meet May 22-25 at Spa, Belgium

FATIPEC- Federation of Technical Associations of the Paint and Printing Ink Industries in Continental Europe, is now well know, after the very successful Conventions held in Paris (1951) and Noordwijk (1953).

FATIPEC's Conventions, have become a tradition, and are scientific events of great interest. To the Belgian Association, ATIPEC, has been granted the honour of organizing the third Convention. ATIPEC, hopes to follow the example of the French and Dutch Associations.

The third Convention will be held from the 22nd to the 27th of May, in Spa, touristic little town, world-widely known for her charm and beautiful scenery, in the midst of the belgian Ardennes.

The subject of the Convention will be:
Colour and Colour Matching:
Theoretical and Practical Aspects.

It has been found that colorimetry and also colour coordination and harmony are everyday problems, needing common study and debate.

The work to be done by the different sections (see below) is in line with the daily scientific, technical and practical problems with which the technologist of our industries are confronted. The third FATIPEC Convention, thanks to the worthy collaboration of all, will bring these problems in a new light and give them a better answer.

Section I: Scientific and technical description of colour. Colour Harmony.

Section II: Colour measurement: methods and instruments.

Section III: Colour matching. Scientific matching and colour tolerance. Practical colour matching. Maintenance of colour standards and reference samples.

Section IV: Standardization and specification. Terminology for standardization purposes. Colour charts and systems.

Section V: Technological factors other than colorimetric to be considered in colour measurement.

The general, administrative and scientific secretariats are established, 32, rue Joseph II, Brussels. Phone: 18.-44.40. Telegrams: Fechimie-Brussels. Checks: nr 703.37 of ATIPIC, a.s.b.l., Congres 1955. Bank: Banque de Bruxelles, nr 356.605 of ATIPIC, a.s.b.l., Congres 1955.

The official languages for the lectures and papers are: French, German and English.

The typed text of all lectures, with figures, graphs, and also the demands for the projection of slides must be sent to the General Secretary before February 1, 1955, otherwise the preprints of the lectures will not be distributed before the opening of the Convention. The text of each lecture must be accompanied by a summary (no lines maximum) in the two other languages.

As a rule, each country member of FATIPEC shall present a plenary lecture. Belgium's plenary lecture will concern Section I.

An exposition, related to the Convention's subject, will be organized. This exposition will have a commercial character, be open to all firms, and be held in the rooms of the Gasino, Spa.

A programme of excursions for the ladies and visits to Paint Works for the effective participants will be developed.

The first booklet, announcing the Convention, gives only preliminary information; more precise details will be given further in another booklet which will be issued, in three or four months.

For instance, the participation price for effective participants will be circa 800 belgian francs, including the delivery of the (Convention Book). The Convention Book will comprise two parts: first containing all the preprints of lectures, the text of which has been handed over before February 1st 1955 the second containing the discussions official publications, and eventually the text of lectures handed over after February 1st 1955.

NEWS

John Gehant Speaks on Losses Due to Corrosion

John Gehant, Director of Maintenance Product Development of the Devoe & Raynolds Company, Inc., spoke before the Society of Corrosion Engineers in New York City on September 22.

In his address, at the Chemists' Club, Mr. Gehant said that, "... the loss due to corrosion of steel freight cars alone was about $162,000,000 per year, or 33-1/3% of the total cost of repairs. With cars such as gondolas the cost of repair due to corrosion was set at 58% of the total repair cost and with hopper cars it was set at 64%."

Mr. Gehant spoke of the nature of the base metals to be protected; the surface preparation of the metal; and environment of exposure, but his emphasis was on the development of new epoxy resins as superior vehicles for protective coatings.

Devoe & Raynolds developed the epoxy resin Devran in 1941 and two variations have been developed in it. One is a type where the resin is used as the alcohol portion to esterify fatty acids and make a coating material that dries in the same manner as the more familiar coatings based on phenolic or alkyd resins.

The second type of epoxy coating, according to Mr. Gehant, is the catalyzed or cold cured—sometimes called self-baking finishes. As these coatings contain no oils or fatty acids, they are far more chemically resistant than any coatings based on phenolic, vinyl, or alkyd resins.

"Epoxy coatings," said Mr. Gehant, "are used wherever attack by reason of acids, alkalis, salts or fats and oils is a cause of failure of protective coatings."

•

Dow Chemical, Devoe & Raynolds Announce License Agreement

Dr. Mark E. Putnam, executive vice president of the Dow Chemical Company, and William C. Dabney, president of Devoe & Raynolds Company, Inc., jointly announced completion of an agreement for licensing the Dow Chemical Company to operate under the epoxy resin patents held or controlled by Devoe & Raynolds Company.

Similar license agreements have previously been completed with the Shell Chemical Corporation and the Bakelite Company, a division of Union Carbide and Carbon Corporation.

Macbeth Corp. Appoints Two New Company Sales Representatives

The Macbeth Corporation, Newburgh, N. Y., manufacturers of color matching equipment, and precision electronic instruments, has announced that Fred A. Jensen Co., Chicago, and D. H. Isgood Co., Detroit, have been appointed sales representatives.

•

Second Vinyl Resin Plant Acquired by National Starch

National Starch Products, Inc. has announced purchase of a tract of land at Meredosia, Ill., on which they will construct a second vinyl resin plant to supplement production of their Plainfield, N. J., plant.

Clyde A. Patterson Retires After 50 Years With Sherwin-Williams

Clyde A. Patterson, chief cost clerk for the Sherwin-Williams Company in Cleveland, has announced his retirement after 50 years of service with the paint firm.

C. A. Patterson

Patterson joined the company in 1904. He served as a mixer in the coach department for several years before helping to establish the firm's auto and carriage test department. There he worked as a formulator before being transferred to the cost department in 1917.

PRODUCTION CLUBS

(*From page 107*)

Louisville Speed School for placing the volume in the Speed library.

The club voted favorably on the Cleveland and Northwestern Club proposals for Federation Honorary Membership. The name of Arthur E. Stauderman was proposed and unanimously approved for recommendation for Federation Honorary Membership.

M. Irvin of the Porter Company introduced Joe Davis of the Goodyear Tire and Rubber Company, who spoke on "The Problems of Interior and Exterior Resin Emulsion Coatings." The Emulsion Coatings were classified as, those giving a continuous film at room temperature and those requiring an elevated temperature.

Quality paints are made with post plasticized or internally plasticized products. The effect of polarity on adhesion and alkali resistance was explained. Freeze-thaw is partly controlled by particle size and the type of emulsion. Butadiene-styrene emulsion have the advantage of economy, versatility and the experience gained from formulation. Protective colloids, pigmentation and vehicle modifiers were illustrated and their effect shown. The good and bad features of exterior masonry coatings were enumerated.

LOS ANGELES

The Regular Meeting of the Los Angeles Paint and Varnish Production Club was held at Scully's Restaurant, September 8, 1954. One hundred members and guests were present.

The Meeting was called to order at 7:45 p.m. by President Venatta.

Earl Hanson, chairman of the good fellowship committee mentioned the Ojai Outing scheduled for October 2, and 3, at $13.00 per person. He also extended Club congratulations to Hugh Miles whose ninth child was born in July.

Joe Mattson, Treasurer, together with Frank Martin, chairman of the audit committee reviewed the club finances. The audit report will be given in full at the next Regular Meeting.

Robert Vignolo, Membership Committee Chairman proposed the following members:

Class "A" Membership—Robert De Muth, Tucson, Arizona; H. David Smith, Lewis Paint; Ted Jensen, Sinclair Paint; Mr. Houshmann, Southern Paint & Lacquer

Howard Hecht of McCloskey Varnish was proposed as a Class "K" Associate and elected by the membership.

Al Abshire, Chairman of summer party committee stated that 440 people were present at the Huntington Hotel party—100 more than expected.

Bert Martin, chairman of the Toronto golf trophy committee, reported that Ted Fitzgerald had racked up the best score ever in the history of the club with 38 on the first nine, and 31 on the back nine.

George Venatta mentioned a letter received from Homer Flynn who will be in England March 30 to April 1, 1955. The Houston Club would like to have a traveler to England to give their paper since they cannot afford to send a representative.

Venatta also mentioned that in the July issue of the Official Digest, Clyde L. Smith was mentioned as the President Elect of the Federation for the ensuing year.

Leo Forth, Jr., chairman of the nominating committee proposed the following names for the respective offices: Vern Barrett, president; Dan Heisler, vice president; Joe Mattson, treasurer; Ed Campbell and Charles Finegan, secretaries.

The floor was opened for additional nominations. Since none came, the Class "A" Membership was given ballots and proceded to elect Chuck Finegan as secretary, Joe Mattson as treasurer, Dan Heisler as vice president and Vern Barrett as president.

George Venatta then took the floor and expressed his sentiments in a farewell address as outgoing president. He stated that he had seen club membership grow from 200 to 335 and expressed thanks to the respective committee chairmen.

Following intermission and the award of door prizes, balloting results were given and Knox Price presented a silver

(*Turn to page 116*)

NEWS

National Aniline Division To Produce Diisocyanates in Buffalo

National Aniline Division, Allied Chemical & Dye Corporation, has started construction of facilities for production of diisocyanates in introductory commercial quantities at its Buffalo plant. The new installation is expected to be on stream during the first quarter of 1955.

All raw materials needed for the production of diisocyanates will be provided by various divisions of Allied Chemical. Diisocyanates of current interest for production of polyurethane rubber, foams, films and adhesives will be manufactured. Products to be produced will include 2,4-tolylene diisocyanate, various mixtures of isomeric tolylene diisocyanates (TDI), 3,3' bitolylene 4,4' diisocyanate (TODI) and p,p' diphenylmethane diisocyanate (MDI). Experimental quantities of these materials will be made available shortly from smaller semi-plant facilities also located in Buffalo.

Research on new and interesting diisocyanates will be continued and every effort will be made to satisfy requests for laboratory quantities of specific products.

Jones-Dabney Building New Chemical Processing Plant

The Resins and Chemical Division of the Jones-Dabney Company, a division of Devoe & Raynolds, has started construction of a new building in Louisville, Kentucky.

The building, consisting of three floors, will be used to house equipment for the manufacture of an entirely new product for use in the formulation and production of paint products.

It will house chemical reactor equipment with an annual capacity of 6,000,000 pounds, but will have sufficient space for additional units making it possible to produce at least 30,000,000 pounds per year. The total cost of the building and initial installation—several hundred thousand dollars—includes the cost of underground storage tanks, a cooling tower and other auxiliary equipment.

The synthetic raw material to be processed in this new equipment constitutes the first entry of the Jones-Dabney Company into the field of emulsion type vehicles for the paint industry and further increases their coverage in the field of resins for use in paint production.

The building is being constructed specifically for the production of polyvinyl acetate, an emulsion product. However, the complete installation can be readily adapted to production of other synthetic latex resins.

The company feels that flat wall paints formulated with the PVA (polyvinyl acetate) type latices show improvement over those formulated with the presently used type latices. These include fuller body, better adhesion, greater solvent resistance and superior flexibility of the aged paint film.

Research, being carried on in the newly dedicated laboratory adjacent to the building, is aimed at further improvements in PVA and other types of resins. Production on the improved products is scheduled to begin early in the spring of 1955.

Establish $54.96 as Tung Nut Support Price; 60% of Parity

The Department of Agriculture recently announced that grower prices of 1954 crop tung nuts will be supported by the Commodity Credit Corporation at not less than $54.96 a ton, basis 18.5 per cent oil content. The equivalent price for tung oil will be 21.2 cents per pound.

Support price for the 1954 crop tung nuts reflects 60 per cent of parity which was $91.60 a ton on September 15.

If parity for tung nuts exceeds $91.60 a ton on November 1, the beginning of the tung marketing year, an upward adjustment will be made in the support price.

Tung nuts from the 1953 crop were supported at $63.38 a ton, 65 per cent of parity as of September, 1953.

ALKYDS

(*From page 41*)

and seals are being made available for transporting the high-viscosity material encountered in this industry.

Some consideration is being given to continuous processing in place of batch methods. With the highly specialized variety of resins required, the trend to larger batches and subsequently lower processing costs, and the high material-to-manufacturing cost ratio, it is doubtful that such systems will be adopted in the immediate future unless it be for production of large volumes and long runs of basic types of resins.

A number of different types of continuous viscosity indicators are now available for better process control. Extensive use of this type equipment in conjunction with continuous determinations of acid number by titration of a circulating side stream is expected.

The use of large weigh tanks holding as much as 10,000 gallons is not uncommon. Strain-gauge devices are being introduced in conjunction with automatic recorders for continuous indication of weights and accurate automatic metering equipment is available for solvent additions and adjustments.

Thus, it is believed the plants of tomorrow will permit remote handling of raw materials, automatic control of process conditions and product characteristics, and will produce a product of uniform quality, comparable to a C.P. chemical, for lower costs than we know today.

Quality Control

It must be appreciated that alkyd resin manufacturing specifications themselves—e.g., viscosity, acid number, per cent solids, color, etc.,—are not a measure of the resin's performance characteristics. However, these specifications are valuable in predicting similar behavior for successive batches of resin. If two resin batches made from the same raw materials and with the same process history have similar properties when cut to a given per cent solids in a specific solvent, then in all probability they will have the same performance characteristic when incorporated into an industrial finish.

Automatic control devices for control of process conditions, temperature, pressure, agitation, gas-blow or solvent rates have already been discussed. These tools insure the necessary uniformity of process conditions. Automatic detection of polymer build-up with time has also been mentioned, and should eventually replace the present methods of sampling and remote testing, with the attendant time lapses. These time lags necessitate the plotting of data and extrapolation of reaction rates to determine the proper end point prior to actual indication. This extrapolation is extremely important with the more reactive short-oil resins discussed earlier, where the difference between a satisfactory, specification resin and a gelled mass may be the testing time involved to determine the resin condition.

Summary

From the above, it can be seen the development and production of alkyd resins to meet the exacting needs of the paint industry of today have been a cooperative effort. The formulator has taken the many new oils, fatty acids, polyols, and polyacids, and developed resins with unique and specific characteristics. The design engineer has designed and constructed plants in which the operating engineers have been able to reproduce consistently these resins, such that equivalent finishes can be produced from day to day.

The progress through the years which has permitted transition of the paint industry from an art to a science has been a joint accomplishment of the resin chemist and the development, design, and operating engineers. Future developments will continue to evolve from this team working together to produce higher quality, more durable, lower cost alkyd resins for the industrial finishing field.

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HYDROCARBON RESINS

(*From page 60*)

and the coumarone-indene resin added as a check prior to reduction with suitable solvents.

In coumarone-indene resin varnishes based on china wood oil (10-18 gallons long) the oil is run quickly to about 400° F., at which point 75% of the resin is added. Rapid heating then carries the cook to the top heat where the balance of the resin is added to check the batch before the oil has an opportunity to string. Bodying is then conducted at about 450° F. Finally, batch is thinned and driers added. In longer length china wood oil varnishes (20-25 gallons long) the coumarone-indene resin alone does not sufficiently retard the gelling of the oil, so holding materials such as other drying oils, fatty acids, rosins or resinate, red or white lead, litharge or lead acetate are added.

At this point is should be mentioned that the addition of phenol-modified coumarone-indene resin such as Nevillac is quite effective in retarding the gelation of china wood and other oils. Such an addition also promotes gas-proofness in varnishes which might otherwise "gas check" or "frost". Some anti-skinning action is evidenced as well on such an addition.

A very large volume of coumarone-indene resins is used by blending solutions of them with bodied drying oils at room temperature. This latter technique is a very convenient one for companies not equipped to cook.

End Use of Coatings

Some of the important uses for coumarone-indene resins in the protective coating field are aluminum paint vehicles, bronzing liquids, pipe coating oils, membrane curing compounds, traffic paints, concrete paints, porch and deck enamels, and also ship bottom paints.

They have likewise found use in the printing ink industry in the formulation of rotogravure inks, as well as inks used to imprint soap boxes, and also in the preparation of gold-inks.

Coumarone-indene resins are included in coatings based on chlorinated rubber to improve gloss, set time and adhesion. Coatings for lining of cans are also successfully made from hydrocarbon resins of this type.

A special low odor and light color coumarone-indene resin (Neville R-7, 108-112°) is now being used in vinyl acetate latex paints. The use of this resin in these latex paints gives freeze-thaw stability without increasing the odor of the paint. It also improves adhesion (particularly to old paint) and retains good outdoor aging.

Future Prospects

Coumarone-indene resins are expected to maintain a firm industrial position being one of the lowest cost resinous materials available. Future prospects for coumarone-indene resins, particularly in the coating field, indicate expanding volume use due to new construction of bridges, tanks and other metal structures which necessitate the use of high quality coumarone-indene based aluminum paints.

New concrete highway construction already underway, and which according to federal state and local authorities will continue, would indicate need for increased volumes of concrete curing compounds. Coumarone-indene resins have found extensive use in this type compound because of their ability to retain moisture and prevent abrasion and also to resist early rainfall on the concrete surface.

Many people in the paint industry are of the opinion that vinyl acetate latex will come into greater prominence as binders in water thinned paints in the immediate future. A special low odor and light color coumarone-indene resin (Neville R-7, 108-112°) imparts desired characteristics to this type of paint; consequently this new application should be responsible for increased usage of this particular grade.

Ship bottom paints as well as a wide variety of industrial and trade sale protective coatings should also consume an appreciable quantity of coumarone-indene resin in the foreseeable future.

PRODUCTION CLUBS

(*From page 110*)

gavel to Vern Barrett as the incoming president.

Barrett then called upon R. J. Blackinton, technical committee chairman for a review of the committee's work. Blackinton discussed the current project at Occidental College on oxidation rates under Dr. Reed Brantley. He reviewed the work done to date on his color calculator and had Bill Jones review the great amount of work done by him on the Sward Hardness Rocker project.

Following the report, Barrett gave a resume of Blackinton's work with the Los Angeles Production Club. Blackinton was elected secretary October 1942, vice president October 1943, and president 1945. He has been technical committee chairman since 1946. Insofar as duties at work have been occupying more and more of his time, he has asked to be relieved of his office as chairman of the technical committee and will act in the capacity of advisor. A rising vote of thanks was expressed by the entire membership for the remarkable record of achievement of R. J. Blackinton.

The meeting adjourned at 10:00 p.m.

The first Regular Meeting of the 1954-55 fiscal year was held at Scully's Restaurant, October 13, 1954, attended by 159 members and guests.

The meeting was called to order at 8:00 p.m. by President Barrett. Following the introduction of guests for the evening, the minutes of the preceding meeting were read to the membership by Secretary Chuck Finegan. With the exception of a minor correction, the minutes were approved as read. President Barrett then announced the standing committees and the committee chairmen for the 1954-55 fiscal year. These committees and their chairmen together with the respective members of the committees are as follows:

- Technical Committee—Jack B. Callaway, Chairman
- Membership Committee—Robert L. Vignolo, Chairman
- Good Fellowship Committee—Lesley W. Houy, Chairman
- Spring Frolic Committee—unselected
- Standards and Methods of Tests Committee—unselected
- Publicity Committee—Ernie Ansley, Chairman, other members—Charles Finegan and I. D. J. Heisler
- Educational Committee—C. Ed Campbell, Chairman
- Constitution and By-Laws Committee—George W. Venatta, Chairman
- Meeting Committee—Maurice J. Sampson, Chairman
- Audit and Budget Committee—Frank Martin, Chairman
- Joint Coordinating Committee—unselected
- Employment Committee—Estol Boehme, Chairman
- Health and Safety Committee—unselected
- Program Committee—I. D. J. Heisler, Chairman
- Summer Party Committee—Robert Dorsett, Chairman
- Golf, Toronto Trophy Committee—Bert E. Martin, Chairman

President Barrett announced that the club is looking for a volunteer to act as chairman for the bridge committee. There were no volunteers so this committee was dropped.

President Barrett then read a letter from the Heckel Publishing Company, Inc. concerning nominations for the 1954-George Baugh Heckel Paint Industry Award. He announced that there were nomination applications available and that any interested party could make nominations for this award by contacting the secretary for the applications. President Barrett then called for reports from committee chairmen. Les Houy, chairman of the good fellowship committee, reported that Clarence Gulick was in the hospital but was progressing nicely. He also reported that George Nagel was at home recuperating after a stay in the hospital.

In the absence of Frank Martin, chairman of the audit and budget

(*Turn to page 120*)

EPOXY RESINS

(*From page 53*)

approximately 3 hours. Use of lower temperatures (450-475° F.) results in excessively long reaction times, low viscosity, and darker colors, while temperatures above 525° F. are not advisable due to possible gel formation at high acid values, particularly in the shorter oil lengths and with the more reactive fatty acids.

Epon resin esters of the short-oil lengths that would normally be used in industrial finishes combine the optimum film hardness, gloss, and chemical resistance properties attainable with

Baked liner coatings based on epoxy resin for tank cars, tanks, and storage vessels, provide protection against alkalis. Baking the lining inside the tank car is done with special high output hot air centrifugal blowers which force heated air thru ductwork attached to the dome. Cars are temporarily insulated to insure that the steel is brought up to full temperature.

esters. In converted films these esters, Epon 1004—dehydrated castor and Epon 1007—soy or coconut, far exceed alkyd films of similar composition in chemical resistance. For example, upon immersion in 20% boiling NaOH a film of D-4 Ester with melamine resin resisted 30 minutes exposure, while a standard alkyd film failed in 1-2 minutes.

Application of Epon resin esters to industrial finishing presents no problem to anyone who is familiar with alkyds. Solvents, pigmentation procedures, and methods of use are similar. Current, large scale use of these esters in baked coatings are in washing machine primers, appliance enamels, and in can coatings.

Amine Cured Systems

The amine cured system is perhaps the most interesting and unique of all epoxy formulations. In this coating system curing in the film depends upon the chemical reaction between a polyfunctional amine, such as diethylene tramine, and the epoxy groups of the resin molecule. This reaction will take place at room temperature, or if preferred, it may be accelerated by the application of heat, using temperatures up to 350° F.

This formulation, based upon Epon 1001, is used both in maintenance paints and in industrial finishes. Two industrial uses that may be cited are the coating of air conditioning units and airplane exterior surfaces that are normally in contact with hydraulic fluids, exhaust fumes, and lubricants. The most striking feature of the coating is that it affords a high order of chemical resistance (comparable to all but the best baked films) but does not require baking.

The coating vehicle is prepared by dissolving Epon 1001 in a suitable solvent blend—50 parts of toluene, 45 parts of MIBK, and 5 parts of butyl "Cellosolve"—and adding a flow control agent. In this case 3% of Beetle[5] 216-8 or 1% of Silicone Resin[6] SR-82 give good leveling. Just prior to application the amine curing agent is added. Approximate application solids for the clear vehicle is 38% (max.).

Once the amine has been added, curing begins, even in dilute solutions, and after 28-30 hours the liquid coating vehicle has set to a useless gel. The formulation is thus not applicable to dip coating. Useful "pot-life" may be lengthened somewhat by change of solvents, presence of the lower ketones tending to retard gelation appreciably. The use of ester solvents is to be scrupulously avoided, since they react with amines and prevent curing.

A somewhat different type of curing agent for the epoxy resins is represented in the polyamide resins offered by *General Mills Company.* These resins are amine-terminated combinations of diethylene triamine and dimerized soy acids, and cure Epon resins by cross-linking with epoxy groups. Systems incorporating Epon 1001 with 50% of Polyamide 100 or 35% of Polyamide 115 show particular promise. At spray viscosity "pot-lives" of 1-3 days are obtained. The Epon-polyamide systems give films slightly poorer in chemical resistance than the straight amine-cured Epon resin system, but flexibility is improved. Epoxy-polyamide films are currently being evaluated as coatings for foil and paper.

5. American Cyanamid Co.
6. General Electric Co.

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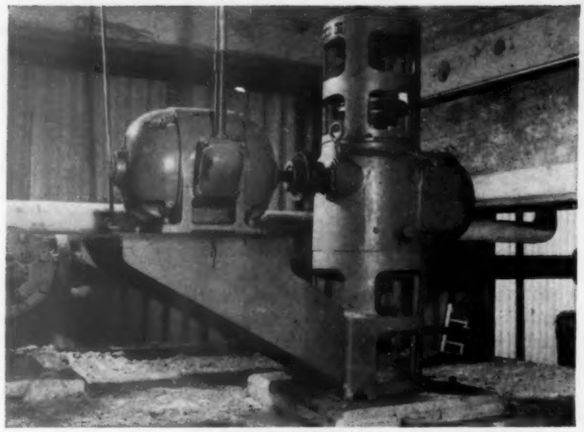

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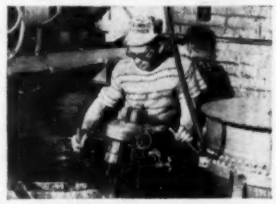

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PRODUCTION CLUBS
(*From page 116*)

committee, John Warner reported.

Joe Mattson, treasurer, said the new fiscal year had started on September 1, 1954 and that it was necessary to compile a roster of all club members for submission to the Federation by November 1st. He emphasized that it would be necessary for all dues to be paid by the November 1st deadline in order for any member's name to be included on the Federation roster and in the Club Yearbook.

Dan Heisler, program committee chairman, reported that the December meeting would be devoted to a 'Ladies' Night.' He announced that he had been successful in obtaining the Rodger Young Auditorium and in engaging Michael Paige and his orchestra for the occasion, to be held Dec. 8.

Jack Callaway, chairman of the technical committee, reported that a meeting of the committee was scheduled to be held on Wednesday, October 20, 1954, at Schully's Restaurant. He requested all members of the committee be present and he invited all other interested personnel to attend and to bring any suggestions with them which could constitute a Club project.

In the absence of Robert Vignolo, chairman of the membership committee, the secretary read the names of all applicants for membership. The following members were proposed and were voted in for Class A membership:

- Edwin Edelstein—Sillers Paint and Varnish Company
- John W. Ellis—Ellis Paint Company
- Robert L. Finch—Finch Paint and Chemical Company
- Lyle Gardner—Ferro-Martin Company
- Manouchehr Houshmand—Southern Lacquer & Paint Company
- T. C. Jensen—Sinclair Paint Company
- George Zenick, Jr.—Interchemical Corporation, Printing Ink Div.

Class K Membership:

- Paxton Beale—Dow Chemical Company
- J. P. Modawell—C. P. Hall Company of California

George Venatta then read a letter received from Dick Savage, a recent member who is now residing in Manila. In his letter he explained many of the difficulties experienced in the production of paint in the Philippine Islands. He also gave a very interesting description of the effect of the war on the Philippines and asked all members to drop him a line.

Dan Heisler, chairman of the program committee, introduced Henry L. Beaks, of the Kentucky Color and Chemical Company, speaker for the evening. He spoke on, "Tinting Strength of Pigment and its Relation to Other Pigment Properties." Mr. Beaks stated that whereas most manufacturers make their own liquids, and therefore become specialists in this particular line, they nevertheless depend entirely upon the pigment manufacturer for all information regarding pigments. He spoke on pigment properties of color, hiding, tinting strength, oil absorption, fineness or uniformity, ease of wetting and dispersing, softness, permanence and solubility. He stated that every vehicle has a pigment loading limit and that several of the good grinding vehicles included blown linseed oil, and metallic soaps such as zinc resinate and lead resinate. The properties of mass color, and tinting strength of pigments involves color in the following three degrees:

1. The amount of light reflection
2. The saturation or chroma
3. The hue

Stating that there were many different methods of testing pigments, Mr. Beaks emphasized the importance of a constant source and quantity of light. The three important properties of a pigment which affect its color are its chemical composition, refractive index and its particle size.

Following a rising vote of thanks to Mr. Beaks the meeting was adjourned at 10:00 p.m.

KANSAS CITY

The second fall meeting of the Kansas City Paint and Varnish Production Club was held October 14, 1954 at the Pickwick Hotel with 27 members and guests present.

President Wormser introduced a number of guests and members. Welcomed were Mr. Taylor of the Eagle-Picher Company, Chicago, Illinois, and Blake Baltuff, a member who had been missing from recent meetings. Bill Weil of the Longwear Paint and Varnish Company and Harold Tucker of the Great Western Paint Company, were introduced.

The minutes of the previous meeting were approved as read. President Wormser said that the St. Louis Paint and Varnish Production Club had determined that there would be fifteen speakers for the 1954-1955 year at the Rolla School of Mines in a course concerning the paint and varnish industry. For the first semester, the St. Louis Club had arranged for four speakers and the Kansas City Paint, Varnish and Lacquer Association will arrange for four additional speakers. Various subjects related to the paint and varnish industry such as pigments, drying oils, resins and related subjects will be covered by the guest speakers. They will use paint testing and evaluating equipment.

Mr. Niewrzel gave the report of the technical committee. He said that on September 29, 1954, the committee had met and observed the results of tests made by the six cooperating companies. It was then decided that two of the members would evaluate the results of the sagging tests on a numerical basis and that these results would be circulated. This work was performed by John Ormsby and V. A. Niewrzel. From this data, one of the committee members, A. L. Kimmel, had prepared a statistical analysis which had not been examined by the majority of the committee. In response to a request from President Wormser, Mr. Niewrzel stated that no paper would be available until such time as the committee was sure of the data at hand. A meeting of the committee would be called shortly and further action decided at that time. Mr. Neal Garlock of the Eagle-Picher Company presented data concerning weathering observations of the tests being exposed at Joplin, Missouri by the Eagle-Picher Company. These tests are of paints prepared by the technical committee and as yet are showing little if any variations in weathering properties.

The speaker of the evening, Howard Hughes of the Eagle-Picher Company at Joplin, Missouri, spoke on "House Paint at Critical Pigment Volume Concentrations." Mr. Hughes set forth the experimental results by Asbeck and Van Loo and others regarding critical pigment volume relationships and stated that his company, the Eagle-Picher Company, had prepared in 1950 a number of multiple pigment paints using the critical volume relationship. The pigment volume of these paints is around 50%. Paint panels used were self-primed and were edge grain. Blister box tests indicate that such paints have a high degree of permeability. The critical pigment volume concentration paints shows marked superiority in repaint work contrasted with alkyds as evidenced by blister box tests. The CPVC paints also show excellent exposure results after four years. While these paints do lack in decorative value, they have excellent durability, and compare favorably with alkyds, particularly with regard to repaint work. A number of panels from the Eagle-Picher test fence at Joplin, Missouri were exhibited. After a question period, the meeting was adjourned.

PHILADELPHIA

L. R. Sherman, director of technical sales, Imperial Paper and Color Corp., presented a paper entitled, "Latex Paint Pigments," at the September 15th meeting of the Philadelphia Paint and Varnish Production Club. It was attended by 120 members and guests at the Engineers' Club.

Mr. Sherman's talk covered: general performance characteristics of pigments in latex systems; test methods and their evaluation; discussion of available pigment forms; selection of pigment classes for interior and exterior applications; and performance characteristics of pigments in different latex systems.

L. P. Sherman

Three new membership applications were presented for their first reading by Jim Sandeman, chairman of the membership committee. They were: H. E. Harkins and W. F. Scheufele, of American Lacquer Solvents Co., and G. I. Mulholland, of E. I. duPont de Nemours & Co., Inc.

New members added to the Club roster were P. K. Williamson, of Smith Paint Products, and L. P. Finnegan, of International Latex Co.

Al Stover, chairman of the technical committee, outlined the project the committee has undertaken on "The Study of Exterior Durability of Copolymer Emulsion Paints."

Dates for the next two meetings of the committee were set at October 11 and November 1.

Hy Katinsky reported that the Operating and Safety Manual which was written by the production problems committee has been turned over to the Official Digest for publication.

A. H. Gowen and D. M. Henry

TORONTO

The first meeting of the new season was held at Diana Sweets on September 20th. Mr. Richard B. Drubel of the Dow Chemical Company, Midland, Michigan spoke on Vinyltoluene in Paints and Varnishes. A. H. Gowen, President for the last 12 months, turned the chair over to D. M. Henry of Canada Printing Ink.

Newell P. Beckwith, President-Elect, and Mr. Milt Glaser, Treasurer of the Federation of Paint & Varnish Production Clubs, were guests of the evening.

CHICAGO

The Production Club held its scheduled meeting on November 1st at the Furniture Club, Lake Shore Drive.

Dr. Eugene Allen, Research Department, American Cyanamid Company, presented a paper on "Color: How the Eye Sees It and Instruments Measure It."

The idea that color can be measured by instruments and expressed on numerical scales is not new. The theory has been worked out over a period of some twenty five years but the practical application of this idea to industrial problems is just beginning to be appreciated. Dr. Allen told of some of the advantages resulting from the use of numerical rating systems for colors based on instrumental measurements and how they may be used in buying and selling colored materials on a specification basis.

NORTHWESTERN

The October meeting was called to order by President Jake Skala with 55 members and guests present. The minutes of the September meeting were read and approved.

E. P. Stark, chairman of the program committee, announced that Dr. W. C. Prentiss of the Rohm & Haas Co. will speak at the November meeting on "Recent Developments in Acrylic Resin Emulsion Paints".

Max Kantor proposed the following names for Class B memberships: Wm. F. Scound, John D. Hockinson, John M. Thompson, all of the Minnesota

Mining & Mfg. Co.

The club elected the following Class A members: John Padden—B. F. Nelson Co.; Edward P. Hoffman—Fr... Paint & Oil Co.

Maurice Hanson, chairman of the committee on proposed amendments, stated that they had made a study of the proposed amendments and recommended that the council delegate who will attend the annual meeting be uninstructed, thus allowing him to make his own decisions, based on the outcome of the caucus. This was put in the form of a motion, seconded and carried.

Ed Erickson presented the Color Aptitude Test to Dr. Bosch, who expressed his sincere appreciation for it.

Chairman of the nominating committee, Ed Erickson presented the following slate of officers for the coming year: Elmer Stark, president; M. C. Hilke, vice-president; Joe Kenny, secretary; L. O. Spilde, treasurer; Ed Carlson, council representative.

A motion that a unanimous ballot be cast was seconded and passed.

E. P. Stark, program chairman, then turned the balance of the meeting over to James Porter, chairman of the open forum committee. He introduced Lowell Wood as moderator, who in turn called upon the following panel speakers: Joe Kenny and John Knutson, who discussed their company's experience with the Color Aptitude Test; Merton Hilke, who spoke on factory color control methods; James Porter, who gave a statistical study of combined color aptitude test results and a survey of instruments used for color control.

A more detailed and comprehensive report will be forthcoming from the open forum committee.

A discussion followed, and the meeting was adjourned at 10:15 P.M.

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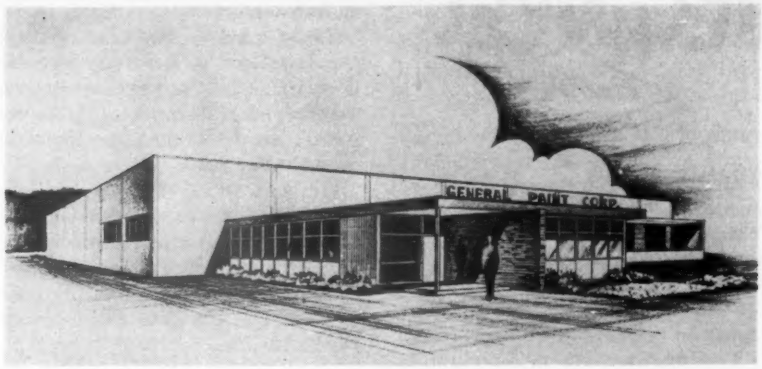
C.D.I.C.

The C.D.I.C. Club held its 343rd meeting at Hotel Arms, Cincinnati, Ohio, October 11, with 63 members and guests present.

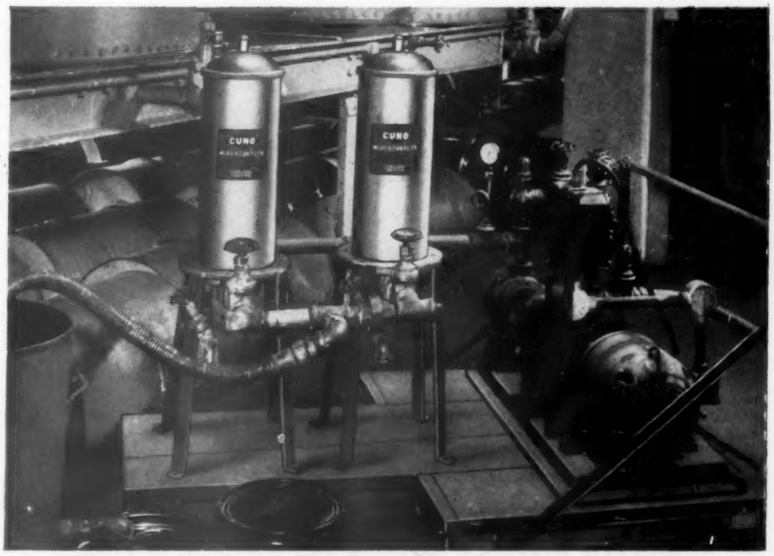
Frank G. Smith, Manager, Paint Test Station, Titanium Pigment Corp., Sayville, L. I., spoke on, "Development of House Paints Pigmented with Titanium Dioxide." Slides were used to supplement and illustrate the speech. Interest ranged high and a lengthy question and answer period followed. Mr. Smith was speaker of the evening.

Charles Toelke, Interchemical Corp., discussed instruments for spectrophotometric determinations. He covered briefly the theory and practice of some half dozen such instruments. It was indicated that a whole program could be devoted to this topic at a future meeting.

PROPOSED NEW PLANT OF GENERAL PAINT CORP.



General Paint Corporation has begun construction on a new district office and warehouse building in Portland, Oregon. The architect's sketch of the building, above, will provide 40,000 square feet of space. When the building is completed, company products will be kept in it for overnight delivery to any part of the Northwest.



TECHNICAL Bulletins

VOLUME PUMPS

Milton Roy Bulletin 1253, just released, describes and illustrates how controlled volume pumps can be used as flow controllers, ratio controllers and final control elements in process instrumentation.

The first section of this pump handbook describes the various types of controlled volume pumps available, how they operate, and how stroke length and speed adjustment can be effected manually and automatically.

The second section contains approximately 20 different process flow diagrams describing typical application in chemical, petroleum, paper, food, water treating and other industries.

An engineering data section contains valuable information on how fluid characteristics and piping affect the operation of these pumps.

Milton Roy Company, Station Y, 1500 East Mermaid Lane, Phila. 18. Pa.

ACRYLONITRILE STUDY

"The Toxicology of Acrylonitrile", published by American Cyanamid Company's Petrochemicals Dept., is now available. It contains abstracts of the more important experimental data, both from published literature and the Company's files. The 16-page booklet also contains a section on the treatment of persons who have been exposed.

The booklet is available on request from American Cyanamid Company, Petrochemicals Dept., 30 Rockefeller Plaza, New York 20, N. Y.

ETHYLENE GLYCOLS

Four-page technical information bulletin on diethylene glycol and triethylene glycol has just been released by Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corp.

Both diethylene glycol and triethylene glycol are used to plasticize composition cork. They are also used in the dehydration of natural gas to prevent the formation of gas hydrates. Diethylene glycol is used in making thin glues and bindery adhesives more flexible. Triethylene glycol helps to control the bacterial content of air when vaporized in specially designed equipment.

Copies of this new technical information bulletin are available from Carbide & Carbon Chemicals Co., 30 East 42nd St., New York 17, N. Y. Ask for F-8085.

FATTY CHEMICALS

40-page technical catalog discusses the ADM's line of fatty chemicals (sperm oils, fatty acids, fatty alcohols, and glycerides) and their applications in various industries. A helpful feature of this catalog is a listing of important definitions used in fatty oil testing, and the inclusion of important tables such as solubility chart, temperature conversion table, weight per gallon of thinners, solvents, plasticizers, and driers. Archer Daniels Midland Co., 2191 W. 110th St., Cleveland 2, Ohio

DISPERSANT

Copies of a technical report describing the characteristics and use of distilled glycerol mono-oleate as a dispersant for odorless thinner—alkyd resin systems is offered by Distillation Product Industries, a division of Eastman Kodak Company, Rochester 3, N. Y.

The report gives the results of a study on how extremely high mono-glyceride content in such dispersions cuts viscosity and stabilizes it against upward drift during storage.

Ask for: "Distilled Mono-glycerides as Alkyd Resin Dispersants" when requesting your copy.

PUMPS

An 8-page bulletin covering its new line of centrifugal pumps designed especially for the chemical, food and other process industries has been issued by Goulds Pumps, Inc.

This bulletin describes construction details, outlines specifications, charts the interchangeability of parts, and shows performance curves of the nine sizes in which these pumps are manufactured. It also lists the various materials of construction in which the pumps are available.

Copies of this Bulletin 725.4 will be sent upon request. Write to Goulds Pumps, Inc., Seneca Falls, New York.

OILS and VEHICLES

Brown-Allen Chemicals, Inc., P. O. Box I, Port Richmond, Staten Island 2, N. Y., has recently published a newly revised technical products book. It covers a greatly expanded line of processed marine and vegetable oils and specialty vehicles for the paint, varnish, printing ink, floor coverings and foundry industries.

A novel feature of this publication is a brief biographical sketch of each of the key personnel together with statements on the company's management, labor, production, sales and development policies. Copies are available by request on your letterhead.

METHACRYLIC ACID

Thirteen-page booklet containing important technical information on glacial metacrylic acid was recently issued by the Rohm & Haas Co., Special Products Dept., Washington Sq., Philadelphia 5, Pa. Properties, handling, polymerization and copolymerization methods, reactions, and applications of glacial methacrylic acid are presented in detail.

CELLOSOLVE ACETATE

Four page technical information sheet on methyl Cellosolve acetate just issued giving physical properties, specifications, shipping data, general solvent properties, and suggested uses for the product.

Methyl Cellosolve acetate is employed in the formulation of lacquers and dopes, where solvent with a moderate evaporation rate is required. It is also an excellent solvent for cellulose acetate and other cellulose esters.

Copies of this technical information sheet, F-8623, are available from Carbide and Carbon Chemicals Company, 30 East 42nd Street, New York 17, N. Y.

CONVEYING EQUIPMENT

A field report on their conveying equipment has been published by Rapistan of Cleveland, Inc., Cleveland, Ohio.

The report, on the World Publishing Company, Cleveland, Ohio, lists the company's problem. Three different types Rapistan equipment were installed at the publishing company. The report gives a five point list of how the system works. The results of Rapistan equipment in the publishing company are then summarized in ten points. A statement, summary, and diagram complete the written report.

BALANCES

Fisher Scientific Company, 717 Forbes Street, Pittsburgh 19, Pennsylvania, has issued a new edition of their Fisher Gram-atic Balances bulletin.

This 8 page illustrated work gives the theory and operation of the single-pan balances.

Included in this bulletin, FS-207, is a description of a special-purpose single-pan balance for weighing sheets of dried paint and other materials that do not fit inside regular weighing compartments.

In Canada write Fisher Scientific Ltd., 904 Saint James St., Montreal 3, Quebec.

FATTY ACIDS

"Fatty Acids in Modern Industry" is the title of a new 24 page catalog issued by A. Gross & Company, 295 Madison Avenue, New York 17, N. Y.

The book contains Specifications, Grades, Packing, and Stock points on distilled Stearic, Oleic, Coconut, Cotton Seed, Soya and Palm fatty acids; as well as information on Glycerine, Pitch and Hydrogenated Tallow fatty acids.

SYNTHETIC CHEMICALS

All products commercially available from Synthetics Department, Hercules Powder Company, Wilmington, Delaware, are listed with characterizing data in a 7 page technical bulletin.

The company's Hercoflex Plasticizers are listed with their acid number, saponification number, refractive index, specific gravity, color, free hydroxyl, viscosity, etc.

Synthetic resins are listed with their description, acid number, color, softening point, viscosity, etc.

The nonionic surface-active agents list their form, color, pH, specific gravity, viscosity, solubility, etc.

CENTRIFUGAL PUMPS

Industrial Filter & Pump Manufacturing Company, 5900 Ogden Avenue, Chicago 50, Illinois has issued a new 8-page bulletin on their line of vulcanized-rubber-lined centrifugal pumps and stainless steel and cast steel centrifugal pumps. Besides giving detail specifications and describing the design and construction features, the bulletin includes performance curves for the various models.

LABELING LAWS

The second supplement for insertion in the National Paint, Varnish and Lacquer Association's "Labeling Laws and Regulations," has been made available through the office of President Joseph F. Battley.

The New Jersey, New York and Oregon hazardous substances regulations and revisions in the California hazardous substances regulations are set forth. Pages 129-130 of the Virginia regulations were reprinted and appropriate changes in the Table of Contents and Index are also included.

The Table of Contents sheet and pages 5 through 13 inclusive, 129 and 205 replace those same numbered pages now in the book. The old sheets should be discarded. Pages 80-A—80-P, 82-A—82-F, and 96-A contain new material and should be inserted in their proper places.

AMERICAN STANDARDS

Booklet containing the titles of American Standards in alphabetical order is available on request from American Standards Association, Inc., 70 E. 45th St., New York 17, N. Y.

BUTYL CARBITOL ACETATE

Bulletin F-8644, a 4 page technical sheet on butyl Carbitol acetate, is now available on request from Carbide and Carbon Chemicals Company, 30 East 42nd Street, New York 17, N. Y.

Information is included on physical properties, specifications, shipping data, and applications.

This solvent is used in the formulation of nitrocellulose and synthetic resin coatings, in the preparation of flash-dry printing inks, and as an extractant for the separation of alcohols and ketones.

ALKYDS

Bulletin No. 14 of "Tall Oil in Industry", published by the Tall Oil Association, 122 East 42nd Street, New York 17, N. Y., is now available.

The bulletin continues the previous discussion on resins and deals with alkyd resins, tall oil in alkyds, phthalic alkyds, maleic alkyds, fumaric alkyds, and other alkyds. Included is a bibliography and a reference list.

ADDITIVES

The September issue of "Raybo References," published by Rabyo Chemical Company, Huntington, West Virginia, covers two topics, "Puffy Paints," and "The Unwelcome Brushmark," and the means of eliminating these deficiencies with the company's product.

The second page lists a dozen and a half questions and answers dealing with the correct Raybo product to use in particular situations.

ACRYLONITRILE

The 9th in a series of advertisements of Acrylo-News, put out by the American Cyanamid Company, 30 Rockerfeller Plaza, brings the number of the more important acrylonitrile abstracts written up by the company to almost 500.

Acrylonitrile is a highly stable bi-functual chemical. It is used in the preparation of pharmaceuticals, insecticides, surface active agents, etc. This latest paper lists items and abstracts, gathered from many sources, to indicate a few facets of current research with the chemical.

PALLETIZATION

The first handbook ever prepared on pallets and their application to industry, is now available without charge from most pallet suppliers, or may be ordered through the National Wooden Pallet Manufacturers Association, Barr Building, Washington 6, D. C., for $1 per copy.

The booklet starts with an explanation of palletization. It continues with sections on principles of pallet construction, specifications, how to choose and purchase the correct pallet, unit load patterns, and instructions for the use, maintenance and inspection of pallets. A glossary of terms and a list of government specifications are included for reference purposes.

CONTAINER SPECIFICATIONS

Latest results in the program for standardization of shipping containers is contained in a report with charts, covering 55 gallon tight head universal drum; 400#/55 gallon full removable head universal drum; 30 gallon tight head universal drum; 120#/16 gallon full removable head universal grease drum; 16 gallon tight head universal drum; 5 gallon tight head universal pail, and 5 gallon/35# lug cover universal pail.

Specifications were developed by the Petroleum Packaging Committee and the Steel Shipping Container Institute Technical Advisory Committee. Steel Shipping Container Institute, Inc., 600 Fifth Ave., New York 20, N. Y.

VINYLS

(*From page 67*)

organosols are suspensions of resin particles in organic media, baking at approximately 350 deg. F. is necessary to fuse the particles into a homogeneous mass in the final film. The length of bake is dependent on the size and composition of the coated surface. Organosols normally bake to a satin finish, but a special technique can be used to obtain a high gloss if desired. In this procedure, the coating is applied and air-dried. It is then baked at a temperature of about 200 deg. F. to dry the film and partially gel the structure without fusing the particles together. At this point, the film can be sanded and polished very readily, and a high gloss developed by power-wheel buffing. After the desired smoothness and gloss is obtained, the finish is fused at 350 deg. F., hardening and toughening the coating while retaining the gloss and smoothness.

Very recently, a type of organosol metal finish which acquires gloss without buffing has been developed, based on vinyl resin VYCM. The development work on this coating indicates that the major factor governing the gloss of a pigmented organosol metal finish is the degree of dispersion at the time it is applied. Furthermore, formulations based on vinyl resin VYCM consistently give better gloss than those based on resin VYNV-1.

The suggested formulation in Table VI is a typical example of an organosol metal finish based on resin VYCM:

The pigment stock (Column A) is ground on a two-roll mill at a temperature of about 60 deg. C. Then 100 parts of the stock are cut with 80 parts of a thinner mixture, consisting of 25 per cent methyl Cellosolve solvent and 75 per cent toluene by weight, and the resultant mixture (Column B) is stirred until a smooth paste is obtained. The base organosol (Column C) is ground in a pebble mill for 72 hours, or until a uniform dispersion is obtained. The pigment paste, base organosol grind, and the other constituents (Column D) are mixed together and pebble-milled for an additional 24 hours to achieve the ultimate composition (Column E).

The coating, as formulated, is applied by spraying over metal primed with wash primer WP-1. After an air-dry of about 10 minutes, the coating is forced-dried for 10 minutes at 200 deg. F., and finally baked 5 minutes at 350 deg. F., to produce an organosol metal finish with superior gloss.

Table VI. Formulation of a high gloss organosol metal finish.

RESIN VYCM ORGANOSOL METAL FINISH XDE-28

	A	B	C	D	E
Ingredient	2-Roll Mill Stock	Pigment Paste	Base Organosol	Other Ingredients	Final Formula
Titanium dioxide[1]	64.8	22.50	—	—	22.50
Antimony oxide[2]	7.2	2.50	—	—	2.50
Bakelite vinyl resin VYCM	—	—	44.78	—	44.78
Bakelite vinyl resin VAGH	17.0	5.90	—	—	5.90
Flexol plasticizer DOP	9.0	3.13	—	6.52	9.65
Blown castor oil[3]	1.0	.35	—	—	.35
Stabilizer[4]	1.0	.35	—	—	.35
Methyl Cellosolve solvent	—	6.95	—	—	6.95
Toluene	—	20.80	—	—	20.80
Diisobutyl ketone	—	—	16.65	1.20	17.85
High boiling diluent[5] (aromatic type)	—	—	66.51	4.80	71.31
2-Ethylhexyl acetate	—	—	—	10.00	10.00
Indanthrene Blue Bakelite vinyl resin VAGH lacquer	—	—	—	Trace	Trace
Bakelite resin BR-18774	—	—	—	0.40	0.40
Total Parts by Weight	100	62.48	127.94	22.92	213.34
Total Solids, per cent	100	55.6	35.	—	40.4

(1) Such as "Titanox" A-168-LO, Titanium Pigment Corp., New York, N. Y.
(2) Such as "Timonox", Texas Mining and Smelting Company, Laredo, Texas.
(3) Such as "Bakers" No. 15, The Baker Castor Oil Company, New York, N. Y.
(4) Such as "Dyphos," National Lead Company New York, N. Y.
(5) Such as "Solvesso" No. 100, Esso Standard Oil Company, New York, N. Y.

The data in this article defines the quality ordinarily to be expected of these resins and of certain coatings made from them, as measured by Bakelite Company's test methods. Because of the infinite variety in the nature of quality of ingredients used with these resins, and in the conditions under which they are processed, Bakelite Company is unable to guarantee like or optimum values for all coating properties and performance data.

Data and suggestions made in this article are not to be construed as recommendations to use any product in violation of existing patents covering any material or its use.

POLYAMIDE-EPOXY

(*From page 57*)

polyethylene, cellulose acetate, cellulose acetate butyrate, cellulose nitrate, phenolics, Mylar, cellophane, rayon, cured epoxy resins, and certain vinyl chloride polymers.

Concrete and Masonry Coatings: Because of their outstanding alkali resistance and outdoor durability, Polyamide Resin 100-epoxy resin coatings appear promising as masonry paints. Moderate chalking occurs but the coatings are otherwise undamaged. Extended weathering tests are now being conducted. These properties along with high dielectric strenght make these coatings of interest for ceramics as well.

Adhesives: Formulations of Polyamide Resin 100 and epoxy resins may be used to join various surfaces such as metals, glass, papers, plastics, natural rubber, neoprene and wood. They appear to show special promise for bonding electrolytic metals to printed circuit bases. A combination containing equal parts of Polyamide Resin 100 and Epon 1001 has shown exceptional promise. The following formulation is suggested:

Combine, just prior to use, 10 parts of Polyamide Resin 100 Solution A and 7.5 parts of Epon 1001 solution at 80% solids in methyl ethyl ketone. Apply the adhesive to surfaces which have been properly prepared by cleaning and, if necessary, sanding. Let stand for ½ to 1 hour (in order to allow solvent to evaporate) and then mate surfaces. Contact pressure only is sufficient for the formation of strong bonds. Cure by heating at 300°F. for 20 minutes. At lower temperatures a somewhat longer curing time is needed.

Solvent-free adhesive formulations based on Polyamide Resin 115 are described in Technical Bulletin Series 11-6.

Casting Compositions: Solvent-free, pourable mixtures of Polyamide Resin 100 and fluid epoxy resins cannot be made readily. Polyamide Resin 115 (Technical Bulletin Series 11-6) is much more useful in casting embedment and reinforced plastic applications. These materials wet glass fibers readily and on curing yield articles of exceptional toughness and impact resistance.

abstracts

Studies on Agglomerations of Latexes with Thickening Agents

G. Frantz, J. Sanders, F. Saunders, Dow Chemical Co., Midland, Mich. Presented before the Div. of Paint, Plastics, and Printing Ink Chemistry, ACS, Sept. 12-17, 1954 in New York, N. Y.

The addition of a thickening agent to a latex agglomerates the latex particles to some degree. It is felt that a better understanding of the complex phenomenon of thickening in a latex paint may result from studies of the agglomeration brought about by adding certain proteins and methylcellulose to a latex.

A series of photomicrographs clearly shows the increase in aggregation as thickener is added to a latex. A difference in agglomeration by protein and by methylcellulose is apparent. The behavior illustrated by the photomicrographs is consistent with studies on the electrolyte stability of dilute latexes containing thickener. It was found that methylcellulose acts as a protective colloid whereas protein thickeners do not.

Measurements of the adsorption of protein thickener on the latex particles indicates that when there is less than enough emulsifier to saturate the surface of the particles, over 90% of the thickener is adsorbed onto the polymer particles. As emulsifier is added in excess of that required to saturate the surface, there is a marked decrease in the fraction of thickener which is adsorbed onto the latex particles.

Types of Interior Wall Finishes

H. Payne, American Cyanamid Co., New York, N. Y. Presented before the Div. of Paint, Plastics, and Printing Ink Chemistry, ACS, Sept. 12-17, 1954 in New York, N. Y.

The records indicate that both aqueous and resinous media have been used for decorative purposes over the past 5000 years. In more recent times the aqueous type has developed from simple whitewash, through the calcimine and casein dry powder paints, to casein and casein-oleoresinous emulsion paints, and the most recent synthetic resin latex paints. The latex paints have been referred to somewhat erroneously as "rubber base paints". At present the resinous type also is available in a variety of forms. These may be grouped in three categories: the calcicoater flats, the oleoresinous flats, and the alkyd flats.

Both the latex flats and the alkyd flats are developments of the past five years and they represent major improvements not only in coating performance but also in ease of application. The latex paints are free from objectionable paint odors because they do not contain organic solvents. Their characteristic odors are due chiefly to a small percentage of monomer which is lost as soon as the coatings become dry. The alkyd paints also can be made relatively odorless by proper choice of oil modifier and use of odorless solvents. Details regarding specific characteristics of alkyd and latex flats are found in other papers of this symposium.

The improved properties of these newer interior wall finishes together with the development of easier methods of application have increased the sale of these products above that which may

be considered as normal. Further developments may be expected to continue the increase in market potential because of man's inherent desire to decorate and redecorate his surroundings.

Oleoresinous Types of Interior Finishes

A. Kromer, A. Olotka, U. S. Indu trial Chemicals Co., Newark, N. J. Presented before the Div. of Paint, Plastics, and Printing Ink Chemistry, ACS, Sept. 12-17, 1954 in New York, N. Y.

Conventional alkyds have not been found suitable for interior flat finishes but research and development have produced special alkyds which overcome the weaknesses of the usual types. Older specials have found application in fields for which they were not intended. The latest types exhibit all the properties that painters and consumers expect when properly formulated, particularly bridging, scrub resistance, stain removal, and enamel hold out.

Other pecial alkyds have been developed which are readily emulsifiable and which upgrade latex paints of both styrene/bu adiene and polyvinyl acetate types.

Water Dispersible Types Of Interior Finishes

D. Kohr, The Sherwin-Williams Co., Chicago, Ill. Presented before the Div. of Paint, Plastics, and Printing Ink Chemistry, Sept. 12-17, 1954 in New York, N. Y.

The past five years have witnessed the spectacular growth of a new type of interior finish based on styrene/butadiene latices. Other types of latices have become available during this period offering the paint chemist a choice of latex binders for paint use. Today it is necessary to specify the type of latex used in a paint rather than use the name latex to describe it.

To date, the progress which latex paints have made has been in the interior field. This picture is changing as latex paints slowly move into the exterior field. At the present time their exterior use has been limited to masonry surfaces. Work is under way to extend this use to include wood surfaces.

The progress in latex or water dispersible paints will be dependent to a large extent upon improvements in the quality and performance characteristics of the accessories used in the formulation of this type of paint. This commonly used accessories are protective colloids, mildew inhibitors, preservatives, foam depressants, plasticizers, coalescing agents, hiding power, colored and inert pigments.

The functional properties of a latex paint, such as application ease, freedom from odor, excellent appearance, good durability, ease of clean-up of application equipment, and most important, the washing or cleansability characteristics of the finish, forecast increased usage of this new class of paint in the years ahead.

Ethyl Linolenate Polymers

Presented by L. A. Witting, S. S. Chang, and F. A. Kummerow, University of Illinois, at the Drying Oil Symposium, 28th Fall (Paul Bunyan) meeting, American Oil Chemists' Society, October 11-13, Minneapolis, Minn.

Highly purified ethyl linolenate was autoxidized for 160 hours with tank oxygen in a closed system maintained at 30°C. The polymer fractions were separated by solvent extractions and the dimer and trimer fractions isolated and characterized. Peroxide, hydroxyl, carbonyl, epoxide, and ethoxyl groups and double bonds of these dimer and trimer fractions were determined by quantitative procedures, modified to avoid the errors which commonly occur in the analysis of oxidized fats. Molecular weight, ultimate analysis and infrared and ultraviolet absorption spectra were also determined. The dimer contained 2.4 atoms of oxygen as peroxide, 1.4 as hydroxyl, 3.1 as carbonyl, 4.0 as ester and none as epoxy group. The trimer contained 3.2 as peroxide, 3.4 as hydroxyl, 4.0 as carbonyl, 6.0 as ester, and none as epoxy group. A portion of the oxygen content of the polymers was not accounted for in this characterization. Since the polymer linkage was broken by enthanolic HCl, it was concluded that the residual oxygen was present in a carbon to oxygen bond linkage which joined monomeric units.

Pr… rties and Uses Of … yrenated Alkyds

C. … ckett, Paint and Chemical Laboral… , Aberdeen Proving Ground, Md. Pr… ted before Div. of Paint, Plastics, an… rinting Ink Chemistry, Sept. 12-17, … 54 in New York, N. Y.

T… acceptance of a new resin in the coa… g field is dependent upon whether it … s some unusual characteristics tha… make it particularly adaptable to acc… plish certain finishing problems. Sty… ated alkyd have much impro… d drying characteristics compared wit… conventional alkyds. While some cha… cteristics of styrenated alkyds are not as desirable as the conventional alkyds, they do not present any difficulty if proper precautions are exercised in formulation and manufacture. The normal disadvantage of poor pigment wetting has been found advantageous for ammunition paints.

Large quantities of styrenated alkyds have been used in the preparation of ammunition paints. The qualification program has amply shown that many paint companies know how to handle styrenated alkyds. The performance of the enamel in the field has proven satisfactory.

Styrenated alkyds have been widely used in Hammer Finishes, where their fast set time and firming of the film is particularly advantageous because it minimizes leafing of Aluminum flake and prevents flow of an unevenly applied film.

Styrenated alkyd enamels are indicated whenever fast drying is required or where poor drying conditions exist. Their use in diverse fields is established.

Styrene Modification of Oils and Alkyds

F. Leutner, E. Brazet, Arco Co., Subsidiary of American-Marietta Co., Cleveland, Ohio, and E. Bobalek, Case Institute of Technology, Cleveland 6, Ohio. Presented before the Div. of Paint, Plastic, and Printing Ink Chemistry, Sept. 12-17, 1954 in New York, N. Y.

The various types of materials which re… t with styrene and other monomers to give clear, nongelled polymerized pr… ducts can be classified as fatty acids, ox… genated and nonoxygenated oils, oi… modified alkyds, and their maleic a… and cyclopentadiene adducts.

… he practical problem of preparing s… factory coatings resins has two a… cts, a) the narrow limits of cond… ns which must be met in styrena… o… oils and oil acids alone, and b) … broader range of condi… ions allowed … he more complex styrenation sys… s such as alkyds and their adducts. … he problems peculiar to the reaction

(*Turn to page 138*)

AMINO RESINS

(*From page 45*)

proper type of melamine or urea resin which can be expected to yield the best results in each of several important properties, the data in Table V may be helpful. Since these data were compiled from a large number of tests, they are, of course, composite. Exceptions in special cases are recognized but, in general, it is believed the data will fit the majority of cases. The necessity for compromise where certain combinations of properties are required must also be considered. Alkyd choice will depend on several factors, such as oil length, oil type, viscosity, acid number, etc., but the amino resin choice can be influenced by the data below. The type listed first is regarded as best in the listed property, regardless of the degree of difference.

Illustrating the choice of amino resins from the property table, in several types of industrial finishes (Table VI).

Future Prospects

Many new applications for amino resins are constantly being realized. While they still occupy the position of "reactive intermediates" the number of other vehicles with which they can be used continues to expand. Particular attention is being given to resins other than alkyds for new and unique film properties. A good example is their use with epoxy resins in new type baking finishes. Multi-component systems involving both alkyds and amino resins are also in use. Other applications wherein melamine resins prevent early surface disintegration on exterior exposure appear to be expanding. Here might be cited both air-dry and bake enamels and lacquers for automobiles and other mobile equipment, finishes for which are required to be weather resisting. Flat-coated stock for post forming is a future possibility for amino resins to yield faster line production. Other amino bodies than urea or melamine are in use today in the manufacture of "nitrogen" resins and there is little doubt that this avenue offers some future new resin bodies with unique properties.

HARD SYNTHETICS

(*From page 59*)

render straight linseed oil varnishes very resistant.

Copal Type Synthetics

Another important class of resins in addition to the three general types mentioned so far can be summarized under the term "copal type synthetics". They are distinguished by unusual property combinations which originate from the unique process of gelling and degelling, used in their manufacture, based on US Patents No. 2,434,168, 2,555,042, 2,471,629 and 2,478,490. The resin properties vary with changes in the processing and depend on the chemical nature of the raw materials used, which may be either of the phenolic, the maleic, the natural copal type or of combinations of these types.

The color of these resins varies from WG to K. Their acidity fluctuates between 10 and 50 and their melting points range between 140 and 175°C, with corresponding fluctuations in viscosity. Due to their good solubility, these resins are suitable for cold cuts in many types of aliphatic hydrocarbons, and are well suited to the modification of alkyd resins. For example, K 333, a standard resin of this type, can be cut easily in mineral spirits and a portion (10-20%) of this solution can be added to an alkyd to improve through-dry and gloss retention. Another method which can be used to upgrade an alkyd using this type of resin is to add a small percentage at the end of the alkyd cook.

All copal type synthetics are oil-reactive and, therefore, permit fast cooking schedules in varnish making. As a rule, bodied oils are used and all of the resin and the oil are heated together to a temperature of about 575°F. They can be cooked with oils to a much higher viscosity than phenolics or maleics, without the danger of gelation. The heating loss is relatively small, because of the heat stability of this particular class of resins.

These resins are very rapid in drying and their varnishes are distinguished by pigment stability, non-skinning and the absence of after-bodying. Their water resistance is close to that of varnishes made with high grade modified phenolics.

There is also a class of specialty type resins which are designed from the standpoint of meeting the requirements of some particular application in the coating field. For example, such a resin may possess a specific compatibility with a given system or it may have definite or narrow solubility limits in a certain solvent. Such resins with custom-tailored physical properties do not, as a rule, appear in commercial brochures along with the general classes of resins. They are usually a result of joint labor and research between consumer and producer.

Since the use of hard synthetic resins in the paint and varnish industry are based on their particular properties, the selection of each type of resin for a given problem is determined by its specific characteristics, as indicated by its physical and chemical property constants.

Surveying the field of application of hard resins, it can be concluded that there is a hard resin available to meet almost every requirement of the paint and varnish industry of today.

Bibliography

1. C. Ellis, the Chemistry of Synthetic Resins, Volumes I & II, Reinhold Publishing Corp., 1935.
2. W. Krumbhaar, Coating and Ink Resins, Reinhold Publishing Corp., 1947.
3. H. F. Payne, Organic Coating Technology, Vol. I, John Wiley & Sons, Inc., 1954.
4. W. Von Fischer, Paint & Varnish Technology, Reinhold Publishing Corp., 1948.

ACRYLICS

(From page 37)

Acrylic Emulsions

Acrylic polymers, similar to the solvent types described earlier, can also be produced in emulsion form. Basically, the film properties are similar, but there are certain exceptions. The films laid down from emulsions retain the water-white color retention, flexibility and age resistance properties of the solution forms. There are, however, a number of fundamental advantages to the emulsion system. For example, the viscosity of the emulsion polymers is much lower than for the solutions since water is the continuous phase and the resin is dispersed in minute, separate particles. This means easy brushing properties. Solvent odors and fire hazards from flammable solvents are avoided. Water, at negligible cost, can be used for dilution rather than expensive solvents. On the other hand, precautions must be taken against rusting of ferrous surfaces to which emulsions are applied. Water resistance is not as high as for the corresponding solution polymers.

The major applications for the acrylic emulsion polymers have been in the field of wall paints and primer-sealers for household use and for exterior use. However, at least two fields of interest exist in the industrial finishing field. One is the production of fumeproof, color retentive, white coatings for factories, bakeries and hospitals. The emulsion polymers provide paints which dry literally in minutes and can be recoated as soon as dry. The paints can be used directly over fresh plaster. The films have no residual odor which is a tremendous help, particularly in food plants and hospitals. The films are color retentive, and are scrub and stain resistant.

The other interesting application is in the field of metal automotive type primers. Fire has always been a major hazard in the application of industrial finishes but particular emphasis has been placed on low fire hazard materials since the recent destruction by fire of an important "fire-proof" automotive transmission plant. Acrylic resin emulsions have proved to be quite interesting for the production of water-based primers for automotive use. They give fast drying speed, good adhesion, good pigment hiding and good hold-out. For protection against corrosion, small quantities of sodium nitrite or sodium dichromate are added.

Future Prospects

Future prospects for the acrylic resins are extremely bright. While cost has been a limiting factor in the past, prices have been reduced as new production facilities for intermediate and final polymers have become available. It is not expected that acrylic polymers will displace a great number of materials currently in use. Rather, they will extend the field of use of protective coatings to areas where satisfactory materials were not available before. This process enlarges the whole field of protective coatings and provides new utility and beauty in industrial finishes.

Glycerine, Soap Association Plan N. Y. Convention, Jan. 26-28

The annual convention of the Association of American Soap and Glycerine Producers will be held in New York on January 26 through 28, at the Waldorf-Astoria hotel.

The technical field of fatty acids and the production of chemicals from fats will take up the first day of the meeting. Soap and detergents merchandising and a general review of the nation's economy will take up most of next two days. Divisional meetings will be held on glycerine, industrial soaps and detergents, and specialty soap products.

The association will hold its banquet on January 28. There will be no speaker at the banquet.

CALENDAR OF EVENTS

Nov. 15-17. 66th Annual Convention, National Paint, Varnish, and Lacquer Assoc., Palmer House, Chicago.

Nov. 18-20. 32nd Annual Meeting of Federation of Paint and Varnish Production Clubs, and 19th Paint Industries' Show, Palmer House, Chicago.

Jan. 26-28, 1955. Association of American Soap and Glycerine Producers Annual Convention, Waldorf-Astoria Hotel, New York, N. Y.

Mar. 2-5. Southern Paint and Varnish Production Club Annual Convention, Hotel Biltmore, Atlanta, Ga.

Mar. 22-24. Third Biennial Spring Symposium and Raw Materials Exhibit of West Coast Paint and Varnish Production Clubs, Statler Hotel, Los Angeles, Calif.

Production Club Meetings

Baltimore, 2nd Friday, Park Plaza Hotel.

Chicago, 1st Monday, Furniture Mart.

C.D.I.C., 2nd Monday.
- Cincinnati — Oct., Dec., Mar., May, Hotel Alms.
- Dayton — Nov., Feb., April, Suttmillers.
- Indianapolis — Sept., Claypoll Hotel.
- Columbus — Jan., June, Fort Hayes Hotel.

Cleveland, 3rd Friday, Harvey Restaurant.

Dallas, 2nd Thursday, No Fixed Place.

Detroit, 4th Tuesday, Rackham Building.

Golden Gate, Last Monday, El Jardin Restaurant, San Francisco.

Houston, 2nd Tuesday, Seven Seas Restaurant.

Kansas City, 2nd Wednesday, Pickwick Hotel.

Los Angeles, 2nd Wednesday, Scully's Cafe.

Louisville, 3rd Wednesday, Seelbach Hotel.

Montreal, 1st Wednesday, Queen's Hotel.

New England, 3rd Thursday, Puritan Hotel, Boston.

New York, 1st Thursday, Brass Rail, 100 Park Ave.

Northwestern, 1st Friday, St. Paul Town and Country Club.

Pacific Northwest, Annual Meetings only.

Philadelphia, 3rd Wednesday, Engineer's Club.

Pittsburgh, 1st Monday, Fort Pitt Hotel.

St. Louis, 3rd Tuesday, Forest Park Hotel.

Southern, Annual Meetings Only.

Toronto, 3rd Monday, Diana Sweets, Ltd.

Western New York, 1st Monday 40-8 Club, Buffalo.

ABSTRACTS

(From page 133)

of styrene with oils and oil acids are considered first, followed by the factors which complicate modification of the system. In the more complex alkyd systems, the effects of pre-and post-styrenation on process and product are discussed.

Vinyltoluene-Divinylbenzene Modification of Drying Oils

By W. Henson, F. Buege, W. Johnson, Dow Chemical Co., Midland Mich. Presented before Div. of Paint, Plastics, and Printing Ink Chemistry, ACS, Sept. 12-17, 1954 in New York, N. Y.

The copolymers of vinyl aromatic monomers with drying oils offer a means of combining and varying, within limits, the characteristics expected of the parent materials. As a generalization, typical vinyl aromatic monomers such as styrene and vinyltoluene contribute fast dry, good color and color retention, gloss retention, alkali resistance, water resistance, and hardness. These properties vary, of course, quite predictably with concentration.

It is the objective of this paper to present some data on the use of a crosslinking monomer, divinylbenzene, as an additional tool for special properties when used in combination with vinyltoluene. Some data on binary copolymers of vinyltoluene with oils but without divinylbenzene are presented as items of comparison and general interest.

Graphs and tables of data are presented showing the utility of solvents in reactions and the physical properties of typical films. Reactions employing solvents make possible the preparation of some desirable copolymers which cannot be prepared by fusion cooking. The use of divinylbenzene as described contributed to the improvement of viscosity, film toughness, and, in marginal cases, vehicle and film clarity.

Styrenation of Alkyds with Controlled Maleic Functionalities

L. Shechter, J. Wynstra, Bakelite Co., New York, N. Y. Presented before Div. of Paint, Plastics, and Printing Ink Chemistry, ACS, Sept. 12-17, 1954 in New York, N. Y.

Polyesters and oil-modified alkyds containing a small amount of an unsaturated acid, such as maleic, together with a major proportion of a non-reactive dibasic acid, such as phthalic or adipic, can be polymerized with vinyl monomers to yield soluble products. The operable polyesters fall in a very narrow range of maleic content, degree of esterification, and amount of oil modification. All of these factors can be combined into one parameter, "maleic functionality", defined as the calculated number-average number of maleic ester groups contained in the ave age polyester or alkyd molecule. A mathematical formula to calculate this functionality was derived and has been found very useful in predicting whether a given polyester composition can be expected to yield a gelled, soluble, or hetrogeneous copolymer on styrenation.

Acrylonitrile as Modifier in Styrenated Alkyds

By J. Petropoulos, L. Cadwell, W. Hart, American Cyanamid Co., Stamford, Conn. Presented before Div. of Paint, Plastics and Printing Ink Chemistry ACS, Sept. 12-17, 1954 in New York, N. Y.

In the relatively short time styrenated alkyds have been available commercially, they have gained a prominent position in the coating resin field because of their fast dry, high gloss, and excellent chemical resistance. Their use in certain applications, however, has been limited by lack of adequate resistance to oils, greases, and hydrocarbon solvents.

To improve these properties, the use of acrylonitrile as a partial replacement for styrene was investigated. Interpolymers were prepared by reacting acrylonitrile and styrene or methyl styrene in different ratios with a linseed and with a doub'e distilled tall oil fatty acid modified glycerol phthalate alkyd resin.

It was found that as the proportion of acrylonitrile increased improvements were obtained in solvent resistance, drying rate, and resistance to chalking

and bronzing in enamels during early stages of exterior exposure.

These properties are attributed to the effects of (1) the greater polarity introduced by acrylonitrile and (2) the increase in chemical bonding of polymer chains with alkyd which occurs when acrylonitrile is added to the styrene-alkyd reaction.

Vinyl Monomer Modification Of Drying Oils and Alkyds

By W. Kraft, Heyden Chemical Corp., Garfield, N. J. Presented before Div. of Paint, Plastics, and Printing Ink Chemistry, ACS, Sept. 12-17, 1954 in New York, N. Y.

The properties of vinyl toluene modified soy and linseed esters and of styrene and vinyl toluene copolymer linseed alkyd resins based on trimethylolethane and glycerol have been studied to develop information on the contribution of each polyol.

The fast dry, good hardness, adhesion to metal, and low color of commercial styrenated alkyds have been obtained with the monomer modified trimethylolethane compositions. In addition, the modified trimethylolethane alkyd products have outstanding alkali and detergent resistance properties as compared with similar materials based on glycerol.

Radiotracer Studies for Styrenated Alkyds

E. Bobalek, J. Bradford, Case Institute of Technology, Cleveland, Ohio. Presented before Div. of Paint, Plastics, and Printing Ink Chemistry, ACS, Sept., 12-17, 1954 in New York, N. Y.

Styrene monomer, tagged with carbon-14 at the β-carbon, was used to prepare styrenated oils, oil-fatty acids, and oil-modified phthalic-alkyd resins. Preparation of the styrenated alkyds followed several procedures of synthesis as reported in the literature. The analytical study was directed primarily to the more complex alkyd resins, using radiotracer techniques to follow the course of the styrene through the analysis flow sheet.

The quantitative separation of phthalic acid as the potassium salt presents no unusual problems; however, the fractionation of oil-acids from polystyrene by differential solubility is an uncertain procedure. Of the several separation methods tried, the most useful was that of Armitage and Kut (Official Digest, *333*, 671, (1952)) which depends on solubility differences between calcium soaps and low molecular weight polystyrene in alcohol-hydrocarbon solvent mixtures. It was found that this fractionation by solubility differences was most successful when the original reaction product contained a minimum of copolymer and/or high molecular weight polystyrene. The importance of the process variables in styrenated alkyd formation is reviewed with respect to their influence on the accuracy of the analytical methods employed. A hypothesis is proposed regarding the importance of copolymerization in the mechanism of the polymerization reactions.

Instrumental Aspects of Styrenated Alkyds

By R. Stafford, R. Hirt, E. Diechert, American Cyanamid Co., Stamford, Conn. Presented before Div. of Paint, Plastics, and Printing Ink Chemistry, ACS, Sept. 12-17, 1954 in New York, N. Y.

The literature on the reaction between styrene and drying oils and/or acids and the nature of the ultimate products is controversial. The analytical approach is potentially valuable for the clarification of the reaction. In this discussion, analytical methods which have been suggested are collected and reviewed critically. Special emphasis is placed on instrumental techniques. The applicability of a selection of methods is illustrated by the detailed analysis of a hypothetical styrenated alkyd resin.

Research—Future Markets for Drying Oils

Presented by Harry W. Barr, Jr., and Odin Wilhelmy, Jr., Battelle Memorial Institute, Columbus, Ohio. Panel discussion at the Drying Oil Symposium, 28th Fall (Paul Bunyan) meeting, American Oil Chemists' Society, October 11-13, Minneapolis, Minn. Panelists: W. O. Lundberg, University of Minnesota; R. L. Terrill, Spencer Kellogg; E. B. Fitzgerald, E. I. du Pont de Nemours.

Battelle Memorial Institute, under contract with the U. S. Department of Agriculture, recently completed a year-long research program on the market potential for fats and oils in drying-oil uses. The primary objectives of this study were (1) to determine the factors that have caused drying oils to lose ground in competition with other raw materials, and (2) to ascertain the conditions under which drying oils might hope to maintain or improve their competitive position in future years. To accomplish these objectives, personal interviews were conducted with numerous producers and consumers of drying oils and manufacturers of competing synthetic materials.

It is evident from the information gathered that significant shifts in formulation practice have occurred in the drying-oil consuming industries, leading to a marked increase in consumption of synthetic raw materials in lieu of drying oils. This increasing use of synthetic materials stems not only from the superior properties that they impart to some end products, but also from the relatively greater research effort that has gone into their development and application.

It is equally apparent that these past trends will continue in the future, unless a major research effort is applied to the drying oils by the Department of Agriculture and the companies that process and sell these oils.

Prerequisite to that research effort, there should be an increased recognition of the potential value of drying oils as basic chemical raw materials and a thorough review, evaluation, and dissemination of the results of previous drying-oil research. The research effort itself should be fundamental in character and should include a thorough investigation of (1) the basic chemistry of the oils, (2) chemical modification of oils, (3) formulation of new, more effective products for established or new markets, (4) mechanism of film formation, and (5) possibilities for developing improved strains of plants from which drying oils are obtained.

Film Thickness and Evaluation of Gauges

Presented at Second Congress of FATIPEC, May 18 23, 1953, Noordwijk aan Zee, Holland.

As the need was felt for a reliable method of measuring film thickness, instruments of different type were investigated, special attention being given to the calibration of the most promising among them. A method was worked out for determining the number of measurements necessary to obtain an accuracy of 5 or 10% under the prevailing conditions. The same procedure can be followed in assessing the accuracy of thickness measurements with all sorts of instruments and on all sorts of objects, provided these instruments are carefully calibrated.

This investigation showed that for painted cold-rolled steel panels the CIMO instrument, if carefully calibrated, requires 12 readings per object to obtain an accuracy of $\pm 10\%$. For the Zeiss micro meter these figures are 21 and 5 respectively.

Cold Check Test of Furniture Lacquers

Presented at Second Congress of FATIPEC, May 18 23, 1953, Noordwijk aan Zee, Holland.

After an introduction on the properties of furniture lacquers the origin and the fundamental principles of the cold check test are discussed. A theory on the mechanism of the formation of cracks in wood lacquers is developed, and its agreement with the results of practical cold check tests is demonstrated. The influence of different variables such as film thickness and

ki‑ of wood have been investigated. Fi‑ ‑ly the practical value of the cold ch‑ ‑ test is fully discussed.

Ep‑ ‑idation and Hydroxylation of ‑nseed Oil

‑esented by Wouter Bosch, E. A. R‑ ‑e and H. M. Hauge, North Dakota A‑ ‑ultural College, Fargo, North Dakota, at ‑e Drying Oil Symposium, 28th Fa‑ (Paul Bunyan) meeting, American Oi‑ Chemists' Society, October 11-13, M‑ ‑neapolis, Minn.

‑hrough epoxidation and hydroxylation reactions it has been attempted to ‑ctivate the double bonds of linseed oil, thus serving as a basis for quick po‑ymerization and esterification reactions resulting in high polymer compounds.

In both types of reactions formic acid and hydrogen peroxide have been used; the proportions and the reaction conditions influenced the nature of the final product as to whether the double bonds were mostly converted into epoxy groups, or were broken to form di-hydroxy and and hydroxy-formoxy compounds.

An epoxidized linseed oil was relatively easily prepared with any amount of the double bonds, up to 70%, having been converted into epoxy rings. The hydroxylation reaction on the other hand has given difficulties in that epoxy groups under the reaction conditions have formed hydroxy-formoxy derivatives and it has been found difficult to hydrolyze the formic acid esters without hydrolyzing the triglycerides.

Steam distillation has been tried to saponify the hydroxy-formoxy derivatives. Only one third of the acid was removed as calculated from the hydroxy-formoxy content. It was found also that the triglyceride had been saponified.

Epoxidized oils have been polymerized with mineral acids, such as sulfuric and phosphoric, at temperatures ranging from room temperature up to ‑50°C. Products with viscosities up to Z_6 and gels have been obtained in ‑ to 4 hours. Fatty acids and dibasic ‑cids have also been reacted with ‑poxidized oils with the formation of ‑mpounds that dried tackfree in 4 to ‑ hours.

‑lycerine Structure of ‑egetable Oil

Presented by H. J. Dutton and J. A. ‑nnon, Northern Utilization Research ‑anch, Peoria, Illinois, at the Drying ‑l Symposium, 28th Fall (Paul Bunyan) ‑eeting, American Oil Chemists' Society, ‑tober 11-13, Minneapolis, Minn.

The automatic, 200-tube counter‑‑rrent distribution apparatus was used ‑ fractionate linseed oil with pentane‑‑exane and furfural as solvents. Iodine values of the fractions ranged from 42 to 260.

After the application of 800 transfers, the weight curve contained 4 major peaks and consisted of 2 normal distribution curves, a third partially resolved curve, and a blend of several unresolved curves. The most furfural-soluble glyceride comprises 18% of the total glycerides and, as determined by iodine value and spectrophotometric analysis, is trilinolenin; the next glyceride comprises 12% and is linoleodilinolenin; the third partially separated curve comprises 25% and is composed of 2 glycerides with 7 double bonds: oleodilinolenin, 20.7% and dilinoleolinolenin, 4.3%.

Under the random pattern of distribution for fat acids, 12.2% linoleodilinolenin, 18.2% oleo-dilinolenin, 14.3% trilinolenin, and 3.5% dilinoleolinolenin are calculated. Since the latter two of these glycerides are not permitted under the strict, even patterns, it is concluded that linseed oil is more accurately described by the random pattern.

Oleoresinous Varnishes from Epoxy Resins and Drying Oils

Presented by Roy W. Tess, Shell Development Corporation, at the Drying Oil Symposium, 28th Fall (Paul Bunyan) meeting, American Oil Chemists' Society, October 11-13, Minneapolis, Minn.

Commercially available epoxy resins derived from epichlorohydrin and p,p'-dihydroxydiphenyldimethylmethane have noteworthy properties when used in various ways in surface coatings. In air-drying systems the epoxy resins

ACETATE BUTYRATE

(*From page 46*)

In fact, for some applications they may be considered internally plasticized since their unmodified films are flexible. For general lacquer purposes, however, the EAB-381 types are the best suited since they combine fairly wide compatibility with good physical properties in film form. This is particularly true of half-second butyrate, the newest EAB-381 type, which has the additional advantage of very low viscosity. The EAB-272 types are distinctive for their high melting point and high hydroxyl content which make them suitable for certain specialty applications. The EAB-171 types are close to cellulose acetate in their film hardness and high tensile strength.

Formulation

Half-second butyrate is the best all-purpose lacquer-type cellulose acetate butyrate. The remainder of the study will show this.

Perhaps the most unexpected property of half-second butyrate is its solubility in some low cost solvent combinations, such as 80 toluene-20 ethyl alcohol. Also surprising is the fact that the choice of solvent materially affects the film properties, with ketone contents of over 60% to be avoided. The best all purpose solvent combination that can be used is one containing 30-40% ester or ketone, 50-60% aromatic hydrocarbon and 10-15% alcohol.

The inherent flexibility and good film properties of half-second butyrate make a high degree of plasticization unnecessary in many cases. In formulating for hardness, tensile strength and high elongation, the best general purpose modifiers for half-second butyrate are the following:

Dow 276-V9	Glyptal 2570
Glyptal 2556	Plaskon 3115

When low temperature flexibility is desired, consideration should be given to Adipol BCA, KP-140, and Flexol TOF.

High resistance to outdoor weathering is one of the most attractive properties of cellulose acetate butyrate, and care should be taken to select modifiers that will retain this property. Modifiers for half-second butyrate films in ratio of 1:1 that have undergone outdoor exposure tests for 17 months without deterioration, cloudiness or discoloration are listed below:

Acryloid B-72
Aroplaz 945X
Glyptal 2556
Plaskon RS-2
Uformite F-240

Application	Advantage of Coating	Suggested Modifying Agents
Metal	good color stability and adhesion, non-whitening on under-water immersion, easily sprayable.	Frances, Campbell and Darling 555B, Reichhold P-376
Paper	high gloss, good adhesion, light stable, good grease resistance, moderate cost	Polyvinyl acetate, Petrex 7-75T, Dow 276-V9, Tricresyl phosphate
Heat seal adhesive	high blocking temperature, good bite at 225°F.	Polyvinyl acetate, Acryloid C-10
Leather finishes	dry coating containing minimum plasticizer, high gloss, low plasticizer migration, high blocking temperature	Glyptal 2556, FCD-555B, Paraplex G-50, Tricresyl phosphate, Castor oil, Dioctyl phthalate
Hot melts	low flammability, low cost, no solvent	Paraplex G-50, Newport V-40, Dow 276-V9
Bronzing lacquers	does not gel or change color in presence of metal powder	Glyptal 2556
Plastic lacquers	good adhesion and gloss, low plasticizer migration	Aroclor 1260, Dow 276-V9, Acryloid B-72
Lacquers for rubber	good flexibility, adhesion to certain types of rubber	Paraplex G-50, Plaskon 3115
Peelable coatings	easy peelability, good temporary protection transparency	Dow 276-V9, Aerosol OT

Table 5. Applications of half-second butyrate.

Applications

Finally, Table 5 lists a number of end uses in which half-second butyrate is now finding application and some of the advantages for each.

References

(1) Malm and Smith, *Ind. Eng. Chem.* 41, 2332 (1949)

ordinarily are esterified with unsaturated fatty acids derived from drying oils. These epoxy resins have now been investigated for use as varnish resins for combination with glyceride oils themselves.

When cooked with linseed oil, the epoxy resins are very reactive and produce varnishes of high viscosity in approximately half the time usually required for preparation of oleoresinous varnishes. Even straight soya oil can be quickly converted to varnishes of high viscosity when cooked with the epoxy resins. Acidity of the varnishes is very low as indicated by an acid number of two or less.

The epoxy resin-oil varnishes differ in several respects from conventional epoxy esters: they usually contain less epoxy resin; they dry more slowly; they yield softer films; and they have better chalk resistance in pigmented coatings. The epoxy resin varnishes have unusually good gloss retention and durability when exposed outdoors in clear coatings upon wood. They are superior to ordinary oleoresinous varnishes and oil-modified alkyds in this respect. Small amounts (5%) of epoxy resin also have been found to greatly accelerate the bodying of soya oil.

In cooking the varnishes at the high temperatures (580°F.) employed, epoxy groups are destroyed and the total hydroxyl content remains essentially unchanged. At lower temperatures (480°F.), the alcoholysis of oils by the hydroxyl groups in the epoxy resin proceeds readily while the epoxy groups remain essentially intact.

Method for Segregating Drying and Semi-Drying Oils

Presented by Herman J. Lanson, General Electric Company, at the Drying Oil Symposium, 28th Fall (Paul Bunyan) meeting, American Oil Chemists' Society, October 11-13, Minneapolis, Minn.

The amount of polymer formed in the heat polymerization of the methyl esters of soybean fatty acids with more reactive esters such as tung methyl esters is greater than that calculated from data on the polymerization with methyl stearate and on the polymerization of the soybean methyl esters alone. This indicates that copolymerization occurs between conjugated and non-conjugated fatty esters in their mixtures. It is shown that the polyunsaturated acids in the soybean methyl esters preferentially enter into the copolymerizations. When highly reactive fatty acids, such as those derived from tung oil or dehydrated castor oil are heated with soybean oil, the acids cannot be extracted from the oil indicating that the acids have polymerized with the unsaturated fatty acids in the glyceride. Under conditions favoring both polymerization and fatty acid distillation, the less unsaturated acids of the oil glyceride come off and their place in the glyceride molecule is taken by the more reactive acids which contribute valuable properties to the oil. Various reactive fatty acids or their methyl esters can thus be used to improve the drying and film properties of drying and semi-drying oils.

Polarographic Studies of Fat Oxidation

Presented by S. S. Kalbag, K. A. Narayan, S. S. Chang and F. A. Kummerow, University of Illinois, at the Drying Oil Symposium, 28th Fall (Paul Bunyan) Meeting, American Oil Chemists' Society, October 11-13, Minneapolis, Minn.

The autoxidation of fats at 60°C. was studied with a polarograph as a means of distinguishing between different kinds of peroxides. The peroxides formed, in methyl esters and triglycerides of similar composition were compared. Formation of peroxides other than hydroperoxides was observed in greater proportions in fats than in methyl esters. Fractionation using mixtures of acetone and pentane-hexane in different proportions led to the concentration of the nonhydroperoxido peroxide in the acetone soluble fraction. This peroxide is reduced at the dropping mercury electrode at potentials more positive than that for hydroperoxide. Fat oxidized in the presence of 0.1% cobalt drier showed only traces of peroxide reducible in the polarographic cell under the conditions studied.

New Books

Technology of Solvents and Plasticizers

By Arthur K. Doolittle. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 1056 pages. Price $18.50.

This work represents a complete treatise on the subjects of solvents and plasticizers and is intended as reference for those engaged in the field of paints, varnishes, lacquers, adhesives, inks, synthetic textiles, and plastics.

In the technical sections, the author emphasizes the behavior of the system studied over a range of variables, rather on specific formulations. The formulator is provided with a scientific basis for deciding on the appropriate composition for a specific purpose. Theoretical aspects are also covered and these are concerned primarily with solvent action and viscosity. There are also chapters dealing with recovery, handling, storage, and shipping of the raw and finished products plus others on technology of solvents for resinous materials, nitrocellulose lacquers, vinyl resin coatings, technology of application, solvent for textile fibers, solvents for adhesives, and the viscosity of liquids. These and others include, the complete physical and chemical data on the 161 solvents and 131 plasticizers now commercially available.

Mr. Doolittle, assistant director of research with the Carbide and Carbon Chemical Co., has been affiliated with the firm since 1932. He is the author of numerous technical papers, and holds 30 patents mostly in solvents, plasticizers, resins, and surface coatings.

Organic Finishing Handbook

1954 Edition. 299 pages. Published by Finishing Publications, Inc., 381 Broadway, Westwood, N. J.

After a lapse of five years, the Fourth Edition of the Organic Finishing Handbook has been issued in 1954. The psat five years have so changed the outlook in the industrial finishing field that it was necessary to rewrite almost the entire 1949 issue.

The material has been organized into five principal sections. The first section contains information on raw materials used in the formulation of modern finishes. The second section describes the surface treatment of metals and outlines the various materials for the application of finishes. In the third section, a variety of industrial finishes have been covered in a broad sense. Methods for testing finishes are outlined in the fourth section, while the appendix, or fifth section, covers miscellaneous topics of practical interest, such as safety, definition of terms, calculation data and economic information.

Petroleum Manual

28th Edition of the Fisher/Tag Manual for Inspectors of Petroleum. Published by Fisher Scientific Co., 717 Forbes St., Pittsburgh, Pa. 220 pages. Price $1.75.

This manual gives now all the essential details for 35 of the most widely used tests for the basic physical and chemical properties of petroleum and its products, such as gravity, color, viscosity, distillation range, vapor pressure, gum content, sulfur, carbon residue, flash point, water and sediment, melting point, cloud and pour points, consistency.

The most useful of the conversion tables adopted internationally in 1953 are reprinted in full in the manual. A variety of other tables have been added, 21 in all, so that the inspector has everything he needs in one handy volume. There's a complete cross-index and a separate numerical index to the official ASTM methods used in the book.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, AND CIRCULATION REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2 1946 (Title 39, United States Code, Section 233) of PAINT AND VARNISH PRODUCTION, published monthly at Easton, Pa., for October 1, 1954.

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Publisher: John Powell, 855 Avenue of the Americas, New York City.
Editor: Anthony Errico, 855 Avenue of the Americas, New York City.
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JOHN POWELL, publisher

Sworn to and subscribed before me this 27th day of September, 1954
(SEAL)

Daniel D. Randall.
Notary Public, State of New York
No. 03-8491000
Qualified in Bronx County
Certs. filed with Bronx and New York
County Clerks and Registers
(My commission expires March 30, 1956)

Ne Expansion Program Announced by Valspar

T Valspar Corporation has launched a l e new advertising and sales expan n program, according to A. H. Gil n, president.

Gibson made these remarks in his pening address to district and fiel sales managers meeting with hon office executives in an intensive thr day sales conference.

"ne of the major objectives of this new program," Mr. Gibson said, "is to provide Valspar dealers with more worthwhile cooperation so that they will be in a strong position to compete in every respect."

Mr. Gibson made it clear that there would be no change in the company's retail merchandising policy of co-operation with the independent paint dealer.

CHLORINATED RUBBER

(*From page 51*)

of swimming pools are also successfully solved by these paints.

With the advent of air-conditioning, substantial quantities of chlorinated rubber paints have been consumed in the manufacture of corrosion resistant finishes both for original air-conditioning equipment, and for maintenance of fans, blowers, air-washers and duct-work in large installations. Many manufacturers of room air-conditioners use a chlorinated rubber finishing system to provide protection for the metal parts within the unit, and for the parts of the conditioner extending outside the room, where resistance to weathering is required. Paper mills and food processing plants are other large-volume users of this type of maintenance finishes.

Chlorinated rubber and chlorinated rubber—alkyd finishes are currently finding increasing use as products finishes, particularly by the farm equipment, air conditioning and electrical industry. Finishes for these purposes may be applied by spray, dip-or-flow-coating. They permit the application of a durable, high-gloss finish in an extremely rapid, low-bake production cycle. Recently the aircraft industry has shown great interest in chlorinated rubber finishes. Typical of recent new uses in this field is its application on Piper Aircraft's new *Apache*, a two-motored all-metal plane finished inside and out with a chlorinated rubber—alkyd finish.

ALUMINUM ALCOHOLATES

(*From page 70*)

Besides an increase in viscosity, other properties of the vehicle are also affected.

1. Aluminum alcoholates remove any water, e.g. from humid pigments and fix this in the form of aluminum hydrate and free alcohol. This reaction is primary and proceeds before any other one.
2. Settling of pigments is decreased.
3. Vehicles and paints which are treated with aluminum alcoholates show improved non-penetration. Even newsprint can be coated without penetration of oil on the back side.
4. Drying is improved, because of increased cross-linking.
5. Tendency for wrinkling of thick layers is decreased, because of excellent through-drying.
6. Water-resistance of coatings is improved.

All of these improvements are achieved by the addition of small quantities (up to 2%) of aluminum alcoholates.

They enable the use of inert pigments with slow drying oils, e.g. soybean oil. It is no longer necessary to use white lead or zinc oxide to obtain tack-free coatings.

The aluminum alcoholates do not react with unbodied oils but on exposure of such mixtures to the air, reaction proceeds. The oxidation products of the oil react with the alcoholates and the oil molecules become interlinked by aluminum atoms. This will delay deterioration of the coatings during weathering. With unbodied oils, the use of a maximum of 5% aluminum isopropylate is adequate.

New Drying Principle

The mixtures of fatty acids and aluminum alcoholates appear to dry extremely rapidly on exposure to the air. When mixed, some increase in viscosity was noted, but water or atmospheric humidity caused immediate solidification. By this method, tall oil and fatty acids residues could be used for rapid drying paints. This property is based on the fact that the aluminum fatty acid soaps which still contain some alkoxy groups, easily exchange this alkoxy group for the hydroxyl group of water. The newly formed aluminum soap is a solid and forms a film bound together by secondary forces, (hydrogen bonds).

It is now possible to prepare tall oil paints drying in a matter of seconds by exposing them to humid air. It must be emphasized that such paints will be useful only for special purposes and in general should not be used for exterior applications.

Aluminum Alcoholate Derivatives

Because of the extreme reactivity of the regular aluminum alcoholates they can be used only with unbodied oils or with carefully selected alkyds and not too-highly bodied oils. However, it has been possible to reduce the activity of the alcoholates in several ways by immobilizing temporarily or permanently one or two of the alkoxy groups. Such derivatives can be used more extensively.

New types have been developed which do not react at room temperatures but only upon heating. They can be used for preparing highly bodied oils and alkyds. Other derivatives have been developed to prepare air-dried films with extreme water resistance (e.g. 60 minutes in boiling water without whitening).

Several of these products and their uses are subject to various United States and foreign patent applications.

Aluminum alcoholates are new components for the building of vehicles for paints. Their multiple reactivity for hydroxyl- as well as carboxyl- groups makes them a valuable tool for combining easily available raw materials to macromolecular compounds and for improving existing vehicles.

Applications in other fields are also under investigation and will be published later.

References

1. M. Kronstein, Paint Varnish Prod. *30* 8 1950
2. H. W. Chatfield, Paint Manufacture *20* 5 1950
3. F. Schlenker, Farbe u Lack 1952, p. 351

ADVERTISERS' INDEX

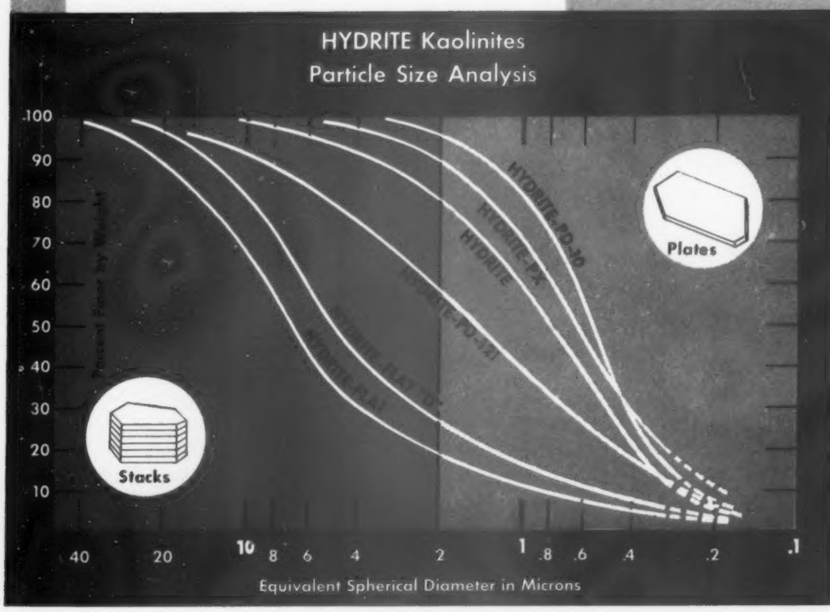
The right kaolinite particle size
does things for your formulation

HYDRITE Kaolinite particles change in *shape* as well as in *size* as particle size decreases. These differences in the six HYDRITE grades have substantial effect on important paint and film properties such as gloss, viscosity, hiding power and application characteristics.

It is important that the paint formulator be fully informed regarding the nature of these effects, so that he may choose the particular HYDRITE Kaolinite pigment extender that will best suit the needs of his formulation.

For that reason Georgia Kaolin Company will run a series of advertisements, beginning next month, giving technical information regarding the effects of kaolinite particle size and shape on various water based and oleoresinous systems.

Watch for them.



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